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REPORT

OF THE

Sanitary Commission

(Created Under Act of the Legislature of 1911)

To His Excellency

The Honorable W. F. Frear,

Governor of Hawaii.

HONOLULU, T. H. 1912

Press of the Hawaiian Gazette Co., Ltd.

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Stephen Spaulding from Coll.
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Report of the Sanitary Commission.

*To His Excellency,
The Honorable W. F. Frear,
Governor of Hawaii,
Honolulu.*

SIR:—We, the undersigned, have the honor to transmit herewith the report of the Sanitary Commission created by the Legislature in an Act approved March 20th, 1911, (see appendix).

This bill was introduced by Senator A. F. Judd, passed unanimously in the Senate and with but one dissenting vote in the House.

Under this Act the following appointments, made by you, were approved by the Senate:

Hon. G. R. Carter,
Dr. D. H. Currie,
Mr. A. R. Keller,
Mr. J. L. Young,
Mr. C. R. Hemenway.

The Commission met for the first time on May first. Since then their minutes show nine regular meetings. They have also met for afternoon inspection tours on fifteen different occasions.

We divided the work into five parts:

- Division I. Water Supply.
- II. Sewerage.
- III. Drainage.
- IV. Building and Living Conditions.
- V. Garbage and General Sanitation.

By early June it was evident to all members of the Commission that no satisfactory study or report could be made without a thorough survey.

After consulting with you, and your consent to the expenditure of \$2,000.00 for a Sanitary Survey, the work was begun in July. The introduction of yellow fever delayed the work, and it proved more difficult to obtain the data desired than was first supposed. The work was carried to completion at a cost of \$2,804.85.

We have compiled information never before gathered, and which is certain to be of great benefit.

Our maps supplement those already in existence, giving not only each building, but every cesspool, privy vault, and swamp, all standing water, all rat-harbors, the density of population, and where tenement conditions were found.

This data and these maps are filed with the Board of Health, and should be of great value to the public for reference and as a basis for future sanitary work.

Dr. Currie resigned on November 17th last, as he was about to return to the mainland, and Dr. G. W. McCoy was appointed on December 15th in his place.

Respectfully submitted,

G. R. CARTER,
GEORGE W. MCCOY,
ARTHUR R. KELLER,
JAS. L. YOUNG,
C. R. HEMENWAY.

SUMMARY.

PART I.—GENERAL.

CHAPTER I.—SANITARY SCIENCE.

Sec. I.—Definition. The best usage in America makes “sanitary science” a term employed to cover knowledge which has to do with health as affected by environment, while “hygiene” is a word used to describe a condition of health related directly to the human body.

For illustration, smallpox may be warded off by vaccination, a process directly upon and in the body, therefore hygienic; on the other hand, typhoid fever is prevented by the purification of water and protection of food supply, a process applied to the environment and therefore sanitary.

Students of the latter are sanitary engineers and health officers, while the science of hygiene is more directly in the hands of physicians. Sanitary problems deal directly with the surroundings and only indirectly with the individual.

Sec. II.—Nature of Disease. If we think of the human body with all its parts in sound working order, moving in favorable surroundings, we have the modern conception of health; but, if we imagine parts or organs out of order or working in adverse environment, we picture the condition from which disease results. Health and disease are special states or conditions. The sources of health are good material, good construction, and wise operation (hygiene) to which must be added favorable surroundings (sanitation).

Sec. III.—General Classification of Disease. Common usage has adopted “constitutional” diseases as distinct from all others. They are those which are due to defects of material or construction.

Sec. IV.—Germ Theory. Two discoveries created the modern

germ theory. That some diseases of previously unknown origin were due to the entrance into the body of certain micro organisms, and second that micro parasites are capable of living outside the body in the environment of man. Then it became easy to understand how certain diseases were caused and spread, also how they may be controlled and obliterated.

Sec. V.—Infection and Contagion. If microscopic plants or animals from living external agents find their way from person to person indirectly through the surroundings, those diseases are called infectious, or, if they pass directly, they are contagious. Practical health work divides along two lines; first, an attempt to reinforce the organism in its struggle with the microbe (hygiene) and, second, efforts toward the exclusion and destruction in the environment (sanitation). Therefore sanitation deals with the control of the extrinsic environment rather than the intrinsic living organism.

CHAPTER 2.—LOCAL NECESSITY FOR SANITATION.

Sec. I.—Geographical. The Cross-roads of the Pacific will always be a point exposed by commerce to every possible form of contagion and infection. Our best protection is therefore to deprive all germs of the means of growth and spread in Honolulu.

Sec. II.—Racial. We have invited to our shores people from many lands and owe it to them that they be taught better standards of living, while they owe it to the land they live in to accept its standards, customs and laws.

Sec. III.—Economic. We cannot afford to be quarantined and left out of the commerce of the Pacific. Expenditures for sanitation will, like those in the Canal Zone, prove of great economic value.

Sec. IV.—Seaports. These are the gateways of commerce through which pour the wealth of nations. The importance of their relation to the interior of a country is recognized among the more intelligent nations. The ideal seaport is said to be one where the residence portion is distant and distinct from the commercial. In the latter only fire and rat-proof buildings are used. People go there for a few hours each day, and in it little or no food is allowed, thus contagion and infection find least chance of lodgment. Disease, if it exists, will be found where people

live and, if this is separated some distance from the commercial section, commerce will be endangered but little and the intercourse of nations will be promoted.

CHAPTER 3.—MODERN DEVELOPMENT.

Sec. I.—Prevention of Disease. Preventable mortality or morbidity are terms used to denote the amount of death and sickness that can be controlled and avoided. Prevention is not used in the theoretical sense, but rather in that in which sickness and death would not occur, if the present knowledge was understood and applied.

If we all lived out of doors there would be no more tuberculosis. It is theoretically preventable to the extent of 100 per cent., but its preventability is figured at 85 per cent., the amount of reduction that would occur if every one followed out the commonly accepted methods of treatment. Experts state that 42.3 per cent. of deaths in America could be prevented.

Sec. II.—Life Can Be Prolonged. Formerly the law of life was supposed to be fixed, and the circumstances surrounding people were supposed to have no influence on the average length of life. This is no longer accepted. The average length of life is definitely known to be increasing in proportion to the wholesomeness of the environment. Life is lengthening in Germany and England, while it is stationary in India.

Sec. III.—Life Can Be Strengthened. Life can be strengthened. Length is only one phase of life—another is breadth or usefulness; one is measured by death, the other by sickness. Few realize how common sickness is and how rarely there is any one over forty who is not in some way impaired in health. Serious illness is that which incapacitates for work, while minor ailments are those which seriously affect our energy and capacity but do not entirely prevent our working. Preventable effort is taking the place of curative. The breadth of life is increasing.

Sec. IV.—Ignorance and Education. There are four great wastes of today, lamentable because unnecessary: they are, preventable death, preventable sickness, preventable low energy and preventable ignorance. Of these preventable ignorance is the greatest, because so largely the cause of the other wastes. The people of the United States are not so advanced in health matters

as those of European countries, our activities are not yet collective. Kentucky advocates a combined Federal Department of Health and Education. In Hawaii we have spent money lavishly for health in some directions, but little or none has been applied to the education of our people in health matters. We have attempted cure rather than prevention.

Sec. V.—Aspects of the Law. Most every one wants to ascertain two things before he obeys any law or health regulation; first, can he be excused from its operation; second, are his neighbors going to obey. It is rarely a law is accepted until tested and enforced by the courts. For this and other reasons the operation of law is usually uneven. Public sentiment, when aroused, often strikes out recklessly and illogically, then subsides into indifference.

The power of our Board of Health is sometimes ample for steady, even operation, then again it finds its load beyond its power. Our predilection for litigation multiplies the cost of health administration. Fines and costs never repay for the loss of time required for legal preparation or attendance on the courts. The only way to correct this is to secure the active interest of all classes in health matters.

CHAPTER 4.—STUDY OF DISEASE.

Sec. I.—Essential Conditions. The germ theory has developed the knowledge that those low forms of life, whether vegetable or animal, require warmth, moisture and oxygen for their growth with a certain amount of food from decaying animal or vegetable materials, hence tropical regions have more germ diseases than others and are liable to be unhealthy.

In order to develop germ diseases three essentials are necessary in addition to the climatic and sanitary conditions: 1st, the cause of the disease; 2nd, the proper transmitting agent; 3d, the susceptible individual: lacking any one of which the disease secures no foothold.

We have already had plague, cholera, amoebic dysentery and dengue.

Diseases not yet introduced are malaria, blackwater fever, elephantiasis, yellow fever, while the other insect-borne diseases are the relapsing fever of Europe supposed to be carried by the bed-

bug. The Rocky Mountain fever is transmitted by a certain tick. The sleeping sickness of tropical Africa is carried by the tsetse fly.

Parasitic diseases are those due to organisms which obtain their nourishment at the expense of some other living thing. These may be either animal or vegetable. They do not originate in our bodies.

Sec. II.—Cause and Classification. For our purpose we desire to classify diseases into three simple divisions:

1. Those obtained through the mouth.
2. Those received by contact.
3. Those spread by insects.

CHAPTER 5.—OUR DEFENSE.

Sec. I.—The Mouth. The mouth is the means by which certain classes of diseases find access into our bodies, either through food or drink or because of direct contact. Typical of this class is typhoid fever. The first defense is therefore the purity of all that goes into our mouths.

Sec. II.—Contact. Of diseases by contact tuberculosis and leprosy are examples. Our defense lies in better living conditions, no over-crowding, and more knowledge spread broadcast as to the probable mode of spread, and how, when affected, we can keep others from contagion and infection.

Sec. III.—Insects. Diseases due to insects are plague, yellow fever and dengue, and naturally our defense depends upon the extermination of the transmitting agent—rats and their fleas and mosquitoes of all kinds. Build out the rat with rat-proof buildings. Remove standing water and all receptacles or places likely to hold water. Keep free of all kinds of insects that careless, slovenly people permit to exist about them.

Sec. IV.—Knowledge. The surest defense is to know the cause of disease and its mode of transmission. When people generally have learned these then that knowledge will bring with it the public support that is necessary in order to protect ourselves from disease, and to confine and eliminate it.

Sec. V.—Federal Quarantine. The description of this great bulwark of our defense is by Dr. D. H. Currie, and it is the clearest and most concise account of the service in Honolulu that can be found. It is notable that there are only six quarantinable dis-

eases. A ship cannot be delayed for any other disease. In fact, splendid as the service is, its effectiveness can at best be only about 60 to 70 per cent., for the only absolute (100 per cent.) safety can be secured by prohibiting all intercourse with other communities. The aim is to facilitate commerce by preventing the transmission of disease. If there is no source or center of distribution there can be no danger. When all the seaports with which we have direct commercial relations are so advanced that disease cannot gain a foothold in any of them, then we need only guard against the danger from other ports, but first we must "put our own house in order."

PART II.—DESCRIPTIVE.

CHAPTER 6.—BOARD OF HEALTH.

Sec. I.—Early History. A perspective is needed for a mind picture as well as one on canvas. The lessons to be learned from the history of our Board of Health are: first, that progress in health matters has always been exceedingly slow; second, that for many years the advance in health matters was led by intelligent volunteers and therefore no other public service has accomplished so much without pay; third, that in Hawaii as elsewhere in the world the value of health work is only just beginning to be appreciated and understood.

The background of our present sanitary situation accounts for much that exists in the foreground. The free distribution of medicine began long before the Board of Health was created. The *practice of doing* rather than *directing* has the force of long usage.

Those connected with the work realize more than any others the importance of it, and have been ever ready to assume responsibility rather than place it upon the individual.

Sec. II.—Great Epidemics. The past teaches us that the alarm and consternation caused by large outbreaks of disease have occurred at ever lessening periods, but fortunately with less intensity as our knowledge increased. There never again need be the fear of number of deaths from smallpox, cholera or plague.

The power to prevent disease is vastly more important than the power to cure. Our record of epidemics is probably as large, as long, and as costly as that of any other community.

Sec. III.—Leprosy. The record of this disease in Hawaii appears to be one of constant claim and counter-claim of assumption of successful results only to find disappointment, of efforts and relaxation, until after 45 years our large expenditure of endeavor and money leaves us with our best claim that of philanthropy. We are no better able to intelligently advise as to the best mode to pursue today than we were when the discussion of absolute or partial segregation first began.

The cost of maintenance has increased in the last three years more than 75 per cent. for each individual in the Settlement.

Sec. IV.—Mortality Records. What those who have struggled for better health conditions have accomplished is clearly shown by our mortality records. In the 10 years from 1876 to 1886 there was an average of 40 deaths out of every 1,000 among those living in Honolulu. The next 10 years the average was 25.3; while the 11 years since annexation shows a still further reduction to 22. This means almost 50 per cent. improvement in 36 years. There have been 26,144 deaths recorded in Honolulu from 1876 to 1911.

Sec. V.—Present Board. The origin, the duties, the powers of the Board of Health, as well as the duties of others, are not often understood, and we have therefore given in the report a brief synopsis of them.

Sec. VI.—Work. Our Board of Health has accomplished just about what Honolulu has been ready to receive. In time the public will demand more; when they become dissatisfied with preventable death, poverty from illness and the cost of neglect, they will demand more from the Legislature and the courts. They will come to the position of more enlightened communities and the Board will be admitted as experts in health matters whose actions are final.

Sec. VII.—Need of Publicity. All of the work of the health authorities is much aided by the press, but sometimes other news crowds out important information which the press is under no obligation to publish.

It is a serious defect, particularly in health work, for the public

representatives to do their work in silence. The Legislature should provide so that the public may receive constant and regular information in regard to its health work by weekly or monthly bulletins. Our school teachers should be helped in teaching the citizens of tomorrow sanitation and hygiene. We need some one to travel from island to island, school to school, village to village, and preach the gospel of good health.

CHAPTER 7.—WATER SUPPLY.

Sec. I.—Brief History. In 1855 the authorities of Honolulu thought they were making ample provision in planning a water system for 6,000 people. In 50 years we have increased our population tenfold and, if we are to profit by the experience of the past, we ought now to plan for nearer 500,000 people than simply to provide for the present needs.

The growth of the water system has been largely a struggle for an ample supply. Scarcity of water every summer was of regular occurrence until the artesian source was used and until the completion of the big dam in Nuuanu.

Sec. II.—Artesians. The earliest mention of the possibility of a pure underground source of water was that of R. C. Wyllie in 1859. The first successful well was bored in 1880. There are now 117 wells in the district of Honolulu, and the level of the water in the artesian basin has dropped 12 feet in 20 years. The important question arises as to how long the supply will last, and when will a stop be put to the waste of wells flowing constantly for irrigation.

Sec. III.—Size of System. The water system furnishes from four to six billion gallons of water each year. This is distributed in 78.61 miles of pipe line, and is delivered through 4,992 connections (for area see map). We have four pumping stations with a daily capacity of 13,500,000 gallons. All our water is from the rain that falls on a small portion of the island and is held by the forest and undergrowth long enough to be absorbed. We use about 18,000,000 gallons a day, but with the pumps and surface supply we have control of about twice our present need.

Sec. IV.—Lack of Protection. Epidemics arouse communities to action as every day danger never does. The danger of infection of our storage reservoir in Nuuanu should not be left to an

epidemic of typhoid before it arouses us. The storage basin should be fenced, all stragglers kept out, and the drainage from the road surface carried by concrete gutters to a point below the catchbasins.

Sec. V.—Waste. The unnecessary water supplied to the people of Honolulu does no harm to health except that the cost deprives us of funds that could be otherwise used, perhaps, for health matters. The excessive waste overtaxes the sewer system, and we are spending now a large sum for an additional trunk line of sewer along Queen Street, all of which could have been saved, if we checked the waste of water. A meter system should be put in and water sold at a low rate, say 5 cents per 1,000 gallons, the cheapest in the world.

CHAPTER 8.—SEWAGE DISPOSAL.

Sec. I.—Early Reference. Another illustration of persistent effort crowned with final success is the sewerage system. There were many who argued from 1880 on that Honolulu could not afford the cost of a sewer system. The cholera epidemic in 1895 brought it, and its success was due to careful planning in advance. The cost of the expert was saved many times over.

Sec. II.—Construction. The system was built in 1899 and 1900 and largely added to in 1904.

Sec. III.—Present System. In September, 1911, there were 2,600 connections and 58 miles of sewers.

The sewerage system cost \$512,796.51 to June 30, 1911, and the cost of operating for the year previous was \$21,146.00.

The sewer pumps are handling daily from 6,000,000 to 9,000,000 gallons of sewage, or about 200 gallons for each individual served; while, if the waste was checked, the normal ought to be 60 gallons.

The leak is caused in part at least by the washing away of two sections of the pipe so that the whole city's sewage is now discharged on the reef in 18 feet of water.

There are still in use 2,263 cesspools, every one of which may contaminate our surface water, and there are 2,403 privy vaults, or a total of 4,666 sources of danger.

Sec. IV.—Defects and Remedies. The volume of sewage depends on the consumption of water. With about two-thirds of our people served, the system is overtaxed. We are pumping

from two to three times the amount estimated for a city of our present size. We are indulging in one of the most extravagant bits of municipal folly possible, paying for pumping water and allowing it to be wasted, then paying for pumping it away as sewage.

It is equally foolish to collect the sewage of our city and then dump it on the reef in 18 feet of water for the tide to carry back and forth or collect in banks of black muck, just as it did in the estuary of the Thames due to London's sewage. No seafood taken in reach of this pollution is fit to eat, nor is it safe to wade or bathe there, and time alone will tell how far it travels.

Hering said: "The best protection from sewer gas is to dilute it with pure air until it is both harmless and inoffensive." This advice we seem to ignore by stopping up the manholes and diminishing the ventilation.

The sewerage system was designed to have the sewage screened so that there would be no floating matter to drift about on the surface of the water. Any fine particles passing through the screens would be further commuted in passing through the pumps and be discharged at the outfall in a condition to prevent them rising in 100 feet of water to the surface. Now handling so large a quantity the advice given is ignored, the screens removed, and everything pumped that can pass through the pipes out on the reef.

CHAPTER 9.—DRAINAGE.

Sec. I.—Early Efforts. In 1876 an Act was passed to provide for right of way for draining land, but not until 1882 did an agitation begin for the removal of standing water on low lying ground in and around the city, and it has kept on gaining in force until now it appears to have become a question which the people of Honolulu are determined to settle.

Storm drains were not of importance until the town spread out over the plains and the damage to street surface was recognized. In 1890 large intercepting ditches were built which take the surface water from the top of Punchbowl and all of Makiki over into Waikiki swamps at Pawaa instead of into the sea as formerly.

Sec. II.—Rainfall. In building drains for surface water proper consideration has not been given to the rainfall. In 1860

1¼ inches fell in 40 minutes, and provision has not yet been made to keep this water out of the swamps.

Sec. III.—Natural. The district of Honolulu contains 44,000 acres out of a total acreage of 384,000 on the Island of Oahu, it is therefore about one-eighth of the whole island. There is a heavy rainfall and there are five main valleys that drain across the city into the sea. Kalihi and Nuuanu streams are fairly direct. Palolo and Manoa spread out on the Waikiki flats, and Makiki has been diverted into the same flats at Pawaa.

Sec. IV.—Artificial. All the water on the front slopes of Punchbowl around Prospect Street is carried to Pauoa stream. There are a number of small culverts and drains diverting water off the street. One system starts at Luso Street, down Punchbowl, crossing King, down South through Kakaako. Another runs from the sea up Ward Avenue (see map), but in no case has there been any general plan made.

Sec. V.—Swamps. The low lands along the sea front of six miles are largely swamps. Wherever profitable they are used for wet agriculture, and the area of wet land has been enlarged until it is difficult now to distinguish between them, nor can the source of water in the swamps be determined except by survey; much of it is water from irrigation. The total area of wet land is 36 per cent. of the land below the foothills.

Sec. VI.—Need of Comprehensive Plans. Heretofore drains have been built only to satisfy an immediate need, a method that is certain to cost a far greater sum than is necessary, requiring enlargements that could be avoided and saved if each storm drain were built as a part of a definite plan. There is wisdom and economy in adopting a well-thought-out plan in advance. It gives an object to work for, a goal to reach.

Sec. VII.—Wet Lands. The increasing knowledge of the immense loss due to mosquitoes is now putting wet agriculture to a severe test. We are beginning to inquire, if against the value of crops should not be set the loss due to mosquitoes and the easy spread of infection.

Another serious defect in the method of wet agriculture within the city, is that dwellings are allowed to be used which are surrounded with standing water and without facilities for sewage disposal, thus enhancing the danger of water infection and the

possibility of typhoid or cholera. The danger from standing water can best be avoided by making such land too valuable for wet agriculture. Money so expended has a double advantage, it brings an improvement to the city and does away with a possible nuisance.

CHAPTER 10.—GARBAGE.

Sec. I.—Our Past. The credit for the first public attempt to remove refuse and waste belongs to J. Mott-Smith, the father of the present Secretary of the Territory. In 1878 as President of the Board of Health, he began a system of street cleaning, and his successor, S. G. Wilder, extended it so as to include free collection of refuse from residences. Since then Honolulu has vacillated between pay and free systems with the former usually unsatisfactory. The habit of hiding or depositing garbage in vacant lots rather than pay for its removal is deep-seated and extends back over 30 years.

Sec. II.—Cost of Management. Since 1905 the county has operated a pay system of collecting city waste, which, measured only by the net cost, has been successful, for its operation has been reduced from \$14,695.00 in 1906 to \$2,084.25 in 1910.

Sec. III.—Present System. The area served is now approximately all the populated portion of Honolulu except Kaimuki. (See map.) The county service plans to carry away all refuse set out by the regular subscribers and charges are from 35 cents to \$7.00 per month. They have 13 mules, 1 horse, 7 wagons and 1 buggy at work.

Sec. IV.—Collection. A pay garbage system is defective because it permits the shiftless citizen to avoid the responsibility of disposing of his own waste. He refuses to employ the service, pleads poverty, cares nothing for the risk of disease, and so hides as best he can his refuse and sets an example to others, until the health authorities or some other civic organization arouses the community to the necessity of a "clean-up day," and then at the expense of others or at public expense the vacant lots and hidden piles of waste are cleaned up. Thus the man who is mean enough to refuse to do his part, escapes. He is neither taxed for a free public service nor does he pay for the removal of his part of the city refuse.

Garbage should be measured by weight rather than by bulk. The average for all American cities is one-half a pound per citizen per day, when the collection is constant and effective. Honolulu should therefore expect some 13 tons per day.

Sec. V.—Disposal. No disposition of the city refuse has proven satisfactory that does not destroy the germs of disease which it is certain at times to carry, nor is the refuse in a city of 50,000 of sufficient value to pay for its disposal. The small quantity of ash in our refuse should enhance its value for fuel, and some day it will probably be used in conjunction with other fuel to furnish power.

The Meldrum Destructor is a furnace built for such purpose; meanwhile it is wise to employ the Thackery Incinerator already installed.

Sec. VI.—Street Sweeping. As our population increases the necessity for better street cleaning and sweeping will become more important. This is of great importance because the dust of our streets causes certain diseases, among which are colds, pneumonia, and tuberculosis. The habit of spitting provides dried particles containing the germs of disease; then, too, the discharge from animals is ground into the dust and partially taken into our systems.

Clean streets are evidence of high culture and of local pride. Money spent economically for such purposes brings bountiful returns in health among those for whom the municipality is created.

CHAPTER II.—REGULATION OF FOODS.

Sec. I.—Early Reference. The early attempts to protect the helpless and innocent from the selfish greed of those who supply our food and drink were unsuccessful. The first attempt to control the sale of milk was made in 1882. In 1888 an attempt to regulate the sale of poi was made. Fish inspection began in 1894. Under the Republic of Hawaii the first pure food act was passed and approved on May 18, 1898. In 1907 began the demand for the control of the environment of food in order to secure its purity, and this is still to be developed.

Sec. II.—Inspection of Fish, Beef and Milk. Since 1909 the county has taken over the inspection of beef and fish. There are

two inspectors for each, and the milk inspectors assist the Federal Pure Food Commissioner.

Sec. III.—Sources and Control of Milk. More than one-fifth of all deaths last year in Honolulu were of children under one year of age, and milk being so important a food for infants, the Commission secured a special inspection of all sources of milk. There were 50 dairies, milking 915 cows, and approximately 5,476 quarts of milk sold daily, or an average of 6 quarts to the cow. The special inspection made for this Commission showed 4 dairies using surface water subject to contamination. Every dairy should be required to use the city's supply of water unless specially excused by the Board of Health.

The conditions of our dairies should be more strictly regulated by law, and the responsibility placed on those who desire to sell milk to see that they are complied with.

The use of cows infected with tuberculosis is altogether too common, and in justice to those who have destroyed cattle so infected, without compensation, there should be a heavy fine for any person disposing of milk from a cow so infected.

Typhoid is so often carried in milk, that sickness among those who handle milk should be reported and a fine imposed for failure so to do.

Sec. IV.—Protection. The officials endeavoring to protect the public from adulteration of foods, from poi of poor quality, milk that kills, meat that is flyblown and fish that is decomposed, are not supported as they should be.

The habit of touching the fish and meat exposed for sale at the market is bad. If permitted to one, it must be granted to all, and some may, perhaps unknown to themselves, be the victims of disease. This may be one of the causes why tuberculosis has spread among the class that uses the market most.

A large part of our fish now arrives on ice, it is exposed for sale, allowed to rise in temperature, and then decomposes more rapidly than if never cooled.

The remedy lies with the customers. In time they will learn to trade only with those who screen their meats, and who keep their fish under glass on cooled tables.

Authorities can do little as their power does not sufficiently per-

mit control over the environment. They can act legally only after the food is actually unfit, after the harm is done, and is thereby subject to proof in the courts.

Sec. V.—Vegetables. The Oriental system of fertilizing vegetables with diluted human excreta is too often employed here in Honolulu, nor is the necessity of pure water realized by the truck gardener. Health officers cannot stop the Oriental customs without active public support. When the same means are devised for insuring the purity of our fish, vegetables and strawberries, then the sales of these will be greatly enlarged.

At Hong Kong a special garden with direct delivery has solved the problem. Dr. Currie's report of the conditions he found in Manoa Valley during the cholera of February, 1911, is a severe indictment of the sanitary conditions tolerated.

CHAPTER 12.—LIVING CONDITIONS.

Sec. I.—The Past. Living conditions did not become an important question until parts of Honolulu became over-crowded. In 1882, Captain Brown, health officer, called attention to the necessity of cutting new streets to relieve congestion and provide better sanitary conditions. The first fire limits were established in that year. The first regular sanitary inspection began in 1890, and the first mosquito campaign in 1904.

The struggle to remove nuisances began with the first Board of Health in 1850, and it has been constant ever since. The keeping of pigs, ducks, chickens, stables, wash-houses, and poi factories have been and still are problems seriously affecting our general health.

Market control has been for years a matter of regulation and surveillance. Unfit buildings are still a problem, while the control of new buildings and plumbing is at last under way, and that of proper location is yet to come.

Sec. II.—Population. The report contains a table showing census of all islands and Honolulu since 1853, also estimates of nationalities in Honolulu.

Sec. III.—Things to be Seen. In an ordinary inspection of the congested portions of Honolulu, one is surprised to find the most ordinary sanitary precautions ignored. One sees buildings

that are a disgrace, and conditions that offer every opportunity for the spread of disease.

Sec. IV.—Sanitary Survey. There are no legal limits to the City of Honolulu as distinguished from the entire Island. It is a district with 130 miles of roads and lanes covering 812 acres. There are 18,381 buildings located within some 12,800 acres.

Household food waste is reported as taken by swill men from 4,060 places. There are 3,273 people keeping chickens, and 197 of them keep them under their houses.

Of all the 18,381 buildings only 3,273 offer free access under them for the enemies of rats—that is 15,410 buildings are ideal rat-harbors.

Our survey accounted for the sleeping accommodation of 49,145 people located in 7,941 dwellings, 12 boarding houses, 34 hotels, 193 lodging houses and 470 tenements, using 266 garages, 897 stables and 1,374 stores.

Sec. V.—Tenements. In 1880 an Act was passed that provided for the control of dwellings among other things. Not until 1880 was there any attempt to control tenements; at that time a license was necessary, which required satisfactory sanitary conditions to be maintained. In 1898 the authorities were given power to prohibit tenements or lodging houses in locations thought unsuitable or objectionable, but this power has not been re-enacted since annexation.

Tenements are all supposed to be licensed and liable to a fine of from \$10 to \$100 for violation of certain fixed conditions. The responsibility rests between the Board of Health and the county. The former had a record of 172 tenements but the county officials reported only 72 licenses issued, while we found tenement conditions in 470 buildings.

The responsibility for the tenement evil is so divided that it is lost. The worst conditions are not in the dwellings owned by the poor, but are found in buildings which are held as investments. Society permits the owner of no other property to offer it for sale or use, when in a condition that makes it a menace to public health.

Sec. VI.—Large Blocks. There is one small rectangle bounded by four streets in which live 5,667 people. All over Honolulu

there are thickly populated blocks without proper means of ingress or egress.

The unwieldy size of so many blocks is a serious drawback. The cause of them is due partly to complicated legal machinery now necessary to be operated before a highway can be opened. This makes the growth of the city slow and accustoms us to conditions that should not be tolerated.

Sec. VII.—New Streets. If Honolulu is to progress it must cease to expect the outside communities (the counties) to contribute to the cost of new streets. At present the whole Territory pays a large proportion of these improvements. There is not revenue sufficient to meet the requirements and if we delay the progress that is being forced upon us by increased commerce and population, we are not worthy of the opportunities vouchsafed to us. Honolulu must pay its own bills, and furnish the capital outlay needed for new streets, with their water mains and sewers, sidewalks, curbs and pavements and leave their maintenance for current revenue. The gain in sanitary conditions will more than offset the cost. If the right of eminent domain is made available to a majority of those owning property affected by a proposed highway, then the more intelligent property owners can secure immediate improvements, and the increased value of their property will stimulate others to do likewise. Honolulu can then become through her own efforts a city worthy of her surroundings.

Sec. VIII.—Mouth Hygiene. We do nothing collectively to save the waste due to neglected mouths and teeth.

The Chicago Board of Health feels justified in announcing that the seat of infection of pneumonia is the media around the teeth and in their cavities, and that the proper care of the mouth will control, if not obliterate that disease.

PART III.—RECOMMENDATIONS.

CHAPTER 13.—GENERAL BETTERMENTS.

The whole of Part III is devoted to the specific recommendations of this Commission and they deal with:

Sec. I.—Wet Agriculture.

Sec. II.—Reclaiming Swamps.

Sec. III.—Opening Streets.

Sec. IV.—Water Control.

Sec. V.—Milk Control.

Sec. VI.—Refuse Disposal.

Sec. VII.—Tenement House Commission.

Sec. VIII.—Publicity.

PART IV.—RESULTS.

CHAPTER 14.—SAVINGS IN WASTE.

Sec. I.—Life and Its Value. We show that it is possible with better sanitation and hygiene to save 500 lives each year in Honolulu. This will in time modify the necessity for immigration, and we estimate the capitalized value of the lives of our 52,183 people at \$131,064,560, while the total taxable wealth of the whole Territory is only about \$151,000,000.

Therefore when providing for the sanitation of Honolulu, we are considering the protection of that which is nearly as valuable as all the material wealth of Hawaii.

Sec. II.—Value of Preventable Loss. In order to measure the waste due to preventable death and sickness we have assumed a low earning capacity and taken the proportion conceded by experts to be preventable, reaching the astonishing result that sanitation offers an annual saving of \$345,176.70, or 5 per cent. interest on \$6,903,534; a sum of money which could, with wisdom, be expended in bettering the health conditions of Honolulu.

England spent \$40,000,000 a year during a considerable period in improving her public health, with a result that in ten years she regained in the value of the lives saved the expenditure of fifteen years.

CHAPTER 15.—POSSIBILITIES.

Sec. I.—Economic Value. Of what value is our wealth, if we are without the blessings of health? Health should bring with it great power to work. It should also bring great happiness

and enjoyment to those who possess it. The world's work depends upon those who enjoy health.

We seldom find a strong, vigorous mind in a weak body. The invalid is idle. He can do little to help others. The community loses his labor and that of those who care for him. It is therefore not surprising that the world is awakening to the great waste of time, of money, of work and happiness, and people are contending that, if this waste can be checked, it is worth all the time, study and cost necessary to bring it about.

Sec. II.—Selfish Gains. It is within our power to control our environment and thereby postpone death, prevent disease, gain more of the pleasures and enjoyment of life and render work a delight rather than a burden.

Our isolation makes the task easier. Our death rate can be reduced one-half. We know our climate is ideal. We have only to take up the task in earnest and bend our united energies to these ends, and the result will be greater even than anticipated.

Sec. III.—Influences. We can by the practical application of the knowledge within our reach set an example which will influence the whole Pacific Basin. We can build here a city more wonderful for its health than its natural beauty, and the health of the community and the joy of living in Honolulu can be made so great that it will become the Mecca for a large part of the world.

ACKNOWLEDGMENTS.

In preparing this Report we have turned in many directions for material.

Through the kindness of Governor W. F. Frear, the War Department supplied a large assortment of valuable reports, covering a number of years and referring to the splendid sanitary work accomplished by our officials in Cuba, Panama, and the Philippines.

No modern work at our disposal contains more information, or information more conveniently arranged than Prof. Irving Fisher's valuable report on "National Vitality, its Waste and Conservation." We have borrowed from it freely and used it as a model.

We have turned repeatedly to the valuable collection of reports and material of all kinds to be found in the Archives of the Territory. The past of Hawaii cannot be intelligently examined without the aid of Prof. W. D. Alexander's "Brief History of the Hawaiian People," which has been freely consulted.

We owe our thanks for courtesy and assistance to many, in fact all, officials, both Territory and County. The Superintendent of Public Works, Mr. Marston Campbell, and the City Engineer, Mr. Guy Gere, have been of particular assistance.

Those who serve and compose the Board of Health, we have used as if our own, while the U. S. Public Health and Marine Hospital Service has furnished the intelligent and necessary leadership of our Commission.

We owe much to the health reports of cities and to none more than that of Chicago.

Among others the following works have been of great help and to their authors we owe acknowledgment:

"Making Life Worth While".....Herbert Wescott Fisher.
"Checking the Waste".....Mary Hunter Gregory.

- "Clean Water and How to Get It".....Allen Hazen.
 "Sanitary Engineering".....Rudolph Hering.
 "Tuberculosis".....S. Adolphus Knoff, M. D.
 "Prolongation of Life".....Prof. E. Metchnikoff.
 "Sanitary Science and Public Health".....Prof. Wm. T. Sedgwick.
 "Typhoid Fever".....George C. Whipple
 "Tropical Diseases and Health in the United
 States".....J. M. Swan, M. D.
 "Municipal Sanitation of Seaports" (South-
 ern Medical Journal, Vol. 14, Number 6,
 July, 1911).....R. H. Von Ezdorf, M. D.
 "History of Leprosy in Hawaii" (American
 Journal of Dermatology, Vol 11, 1906)....E. S. Goodhue, M. D.

INTRODUCTION.

No subject is attracting greater public attention at this time throughout the civilized world than public health and hygiene. The great possibilities of preventive medicine appeal to the imagination.

The fight against tuberculosis shows what can be done with other diseases, encourages effort and gives hope.

The study of defects in school children is opening a wonderful field of economic value, for in saving the child the state is saved. The possibility of prolonging the average life is revolutionary and upsets the actuary's theories of a fixed law of life.

Communities begin to realize that man is entitled to good health, as well as life and liberty, and that it is within reason to expect from the state protection of health as well as the enjoyment of property. Common health is perhaps more important than common wealth. The community's welfare is of greater importance than any individual's interests. Liberty, as well as property, which injures the health of others is not entitled to judicial protection. Some communities are realizing that those on whom the responsibility of our common health rests must not be unnecessarily hampered by the technicalities of laws or the delays of courts.

In the future, when our doctors become as active as our lawyers, we may be taught to revere and respect "The Temple of Health" as equally resplendent and important with that of "Justice," and when a question of precedence arises, the greatest good to the greatest number will show that as justice is least affected by delay, health matters must lead and the authority of the courts follow, undiminished, but only in review.

PART I.—GENERAL.

CHAPTER 1.—SANITARY SCIENCE.

SECTION I.—DEFINITION.

Some authorities define "Sanitary Science" as a term conveniently employed to cover knowledge which has to do with health—either personal or public. If this definition is adopted the term is the equivalent of "Hygiene." Formerly in Great Britain the term "Sanitary Science" was used largely to the exclusion of the term "Hygiene," while in Germany the reverse was and is still the case. In America both the terms "Sanitation" and "Hygiene" are used rather indiscriminately.

Of late years there has come about a more practical difference between "Hygiene" and "Sanitation," the former being largely in the hands of physicians, and the latter largely in the hands of sanitary engineers; the latter dealing directly with the environment of disease and only indirectly with the individual or person. Some diseases may be warded off by increasing the vital resistance of the mechanism, while others may be prevented by an adequate control of the environment. Smallpox, for example, may be warded off by vaccination, a purely medical and therefore "hygienic" process. Typhoid fever on the other hand is best prevented by proper control of the environment, purification of the water, and protection of the food supply. These are "sanitary" problems dealing directly with the environment and only indirectly with the individual.

"Hygienic" more particularly refers to the proceedings directly affecting or dealing with the bodies of the people themselves, and "sanitation" with the proceedings dealing directly with the environment and only indirectly with the human mechanism. There are, however, authorities who prefer to use the term "hygiene" for the whole subject. Then, that which we term as

“sanitation” would fall under “public hygiene” as distinct from “personal hygiene.”

SECTION II.—NATURE OF DISEASE (MODERN CONCEPTION).

It is important to be as clear and definite as possible in the use of the terms “health” and “disease,” which are not always thoroughly understood.

Modern physiology regards the human body as a physical mechanism, an intricate piece of machinery subject to all the conditions and limitations to which any machine is exposed. If around this mechanical view, we throw that other modern conception—environment—and picture to ourselves the human body as a mechanism, not only deriving energy from its environment and doing mechanical and other forms of work, but giving back to the environment heat and waste products, we shall have a more helpful conception of the human body from which to draw clearer and more logical ideas of health and disease.

The condition of health is that of the body with all its parts in sound working order, moving in a favorable environment.

On the other hand we may regard any condition of the mechanism in which one or more parts (organs) are out of order, or working under unfavorable environment, as *a condition from which disease results*.

The essential bases for “health” are sound and proper construction and operation of the human mechanism under favorable conditions. This makes the sources of our health plain. They are, good material, good construction, and wise operation or management (hygiene) to which we must add favorable surroundings or environment (sanitation).

In so far as the mechanism is affected by hereditary circumstances, they are today for the most part beyond the control of either sanitation or hygiene, and form a distinct branch of the science of health, which is termed Eugenics. But so far as health and disease are dependent upon good care, management or operation, and especially in so far as they are dependent upon favorable environment, they are obviously subject to our influence and control.

SECTION III.—GENERAL CLASSIFICATION OF DISEASES.

For general purposes disease may be roughly divided into two classes; those due to defects of material or construction, which hence may be described as “constitutional;” and those which proceed more directly from external sources and are due to mechanical injuries, poisons, parasites, or other external conditions. The latter health experts are learning rapidly to control, while the former, being largely hereditary, are at present not so easily mastered.

It should not, however, be overlooked that both material and construction of the mechanism may suffer damage from the action of slight external causes, or that some so-called constitutional diseases may take their origin in the environment.

SECTION IV.—GERM THEORY.

To the Nineteenth Century belongs the credit of the discovery that certain diseases of previously unknown origin are due to the entrance into the body of certain micro-organisms, or germs as they are usually called.

In 1880 to this was added another discovery; i. e., that germs are capable of living outside of the bodies of plants or animals in the environment of man, and especially in material intimately associated with human life. It then became easy to understand how certain diseases are caused and spread, and also how they may be controlled and even suppressed.

SECTION V.—INFECTION AND CONTAGION.

Once the principle has been clearly recognized that there exists a large class of diseases, all of which are due to the entrance into the human body of either microscopic plants or animals from *living external agents* together with the additional fact that these germs or agents find their way from person to person, either directly (contagion), or indirectly (infection) through environment; it becomes a fascinating study to detect and discover the precise routes by which infection or contagion travels; the material vehicles by which these germs are conveyed; their resistance; their endurance; their distribution from person to person, from community to community, from nation to nation.

The search for agents of disease shows that the invasion of the body by germs of whatever sort is to all intents and purposes an attack upon it by parasites and once this is understood it is evident that, as in other cases of parasitism, the process is a struggle between the invading parasite and the resisting organism. It is not an attack on a passive subject, but a struggle between host and parasite, or, for example, between man and microbe.

In the case of certain germs, the parasite excretes a poisonous substance known as toxin; while the host, if strong and healthy, develops what is known as anti-toxin—a substance capable of neutralizing the toxin.

Practical hygiene and sanitation may proceed along either of two lines (a) reinforcement of the organism in its struggle with the infectious microbes (hygiene), or (b) exclusion of the microbes and their destruction in the environment (sanitation).

CHAPTER 2.—LOCAL NECESSITY FOR SANITATION.

SECTION I.—GEOGRAPHICAL.

Where else in the world is sanitation of more importance than in Hawaii? Probably no other community is so exposed, not only from its geographical position, but because it is surrounded by the ancient civilization of so many different races.

Three-fifths of the world's population borders on the Pacific Ocean. Only a small percentage of that population realizes that most diseases are preventable; that filthy, dirty habits, and the toleration of certain insects and rodents are fruitful sources of infection. While among a large percentage of that population are found all the favorable conditions for developing diseases.

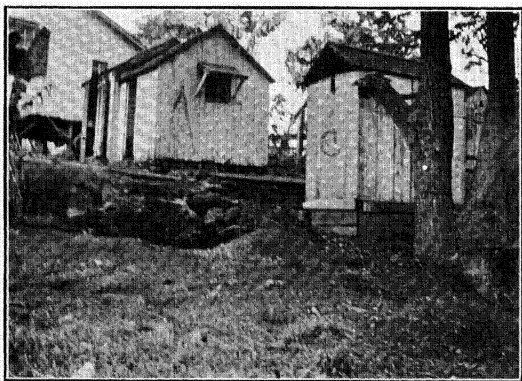
We should not criticize nor condemn our neighbors, but rather set them an example; show them that we belong to that part of the civilized world which recognizes the fundamental truth of Pasteur's epoch-making statement: "That man has the power to rid himself of every communicable disease."

Deaths from tuberculosis, leprosy, pneumonia, as well as cholera and plague, not only in Hawaii but throughout the world

are unnecessary. Most of the deaths from these diseases could be prevented, if only that portion of the world's population living in that environment applied the sanitary and hygienic knowledge now available.

SECTION II.—RACIAL.

Under the strain of economic conditions our population has increased by the importation of numbers, not only from our neighbors in the Pacific, but from half around the globe. We



A—WASH-SHED B—CESSPOOL C—CLOSET D—DITCH
Closet not more than 20 feet from ditch.

have invited and encouraged those who have come from the Islands in the Atlantic Ocean, from the Azores and from Porto Rico, as well as from the Pacific. Therefore, exposed as we are from our geographical position—at the cross-roads of the Pacific—our public health problem is complicated by a great diversity of races.

We need not here discuss the traits of character of the various races invited to these Islands; whose habits do not, when judged by our standards, appeal to our reason; rather must we face the

situation and realize that our responsibilities are in proportion to the prejudice and ignorance that exists among them.

There are, of course, other reasons for the careful study of our environment than those caused by our geographical position, or by the character of the races which form our population.

The Panama Canal will undoubtedly be opened in 1913, rather than in 1915. The proportion of increased commerce is now almost daily commented upon by the press. We cannot afford to be quarantined and left out of the commerce of the Pacific. The loss in such case is both direct and indirect.

Unfortunately our harbor is such that we cannot erect wharves at such distances as to keep contagion at arm's length. To enter the Harbor of Honolulu is practically to enter the center of our city, and make infection from mosquitoes, flies and refuse difficult to prevent.

SECTION III.—ECONOMIC.

To prevent infection of our city we must adopt modern methods and modern laws. Fortunately reciprocity in health matters is universal. We can, without cost, benefit by the experience of every other community.

The world is amazed to find that science and money have made the Panama Canal Zone a healthier place of residence than the mainland. The French company which undertook the canal did not realize that the first cost of prevention for sanitary measures would be economy. Lavish, as our engineers appear to be in their allotments for the sanitary work, it is now clear that time and money have been saved because of this prompt and early expenditure. Had Congress failed to sustain the engineers in this, it is doubtful if the canal could have been completed within the original estimate of cost.

If local opinion and our Legislature do not sustain the large expenditure necessary for our protection from contagion, it is equally certain that the cost in the end will be infinitely greater.

SECTION IV.—SEAPORT.

Dr. Von Ezdorf in his article in the Southern Medical Journal of July, 1911, on Municipal Sanitation of Seaports, gives the resolutions adopted at the Fourth International Conference of Ameri-

can Republics, held in 1909, among which the following are of particular interest to us:

They recommend: first, all possible attention by American governments to the sanitation of seaports, so that the introduction of plague, cholera, and yellow fever might be prevented; and, that if either of these diseases reached a port, it be promptly isolated and measures taken to prevent its spread.

Second, the proper construction of rat-proof buildings, especially those designed for the storage of foodstuffs, granaries, abattoirs, and stables.

Third, the use of galvanized iron garbage cans with tight-fitting covers, for the reception of refuse from houses, and the daily disposal of such refuse.

Fourth, that the crusade against mosquitoes be carried on vigorously.

Fifth, that every seaport should be provided with a proper system of sewerage, adequate supply of pure water, and *paved* streets.

Sixth, that in every port there should be a sanitary authority clothed *with ample power* to vigorously enforce sanitary conditions.

Seventh; that it be made obligatory for the schools to furnish instruction in the elementary principles of hygiene and sanitation.

That these conferences have had their effect and that our South American cities are making great progress in these lines is indicated by the fact that at Buenos Ayres, Rio de Janeiro, and Santos, the water front conditions are now said to be almost ideal. These communities have spared no expense, for they have recognized the importance of their commerce.

Dr. Von Ezdorf believes that the ideal seaport should clearly distinguish between the residential section and the business section. The latter with its limited hours for work and where people gather for the purpose of commerce and stay principally during the day, is no place for a sick person. The business section should have its buildings fire and rat proof; its wharves of iron and concrete, containing no low dives, cheap saloons or lodging houses—in which the sailor infected in some foreign port usually begins the spread of disease, and in which the rat, mosquito, fly,

roach, and vermin of all kinds often find harbor. In this manner the chances of infection are reduced to a minimum.

Disease usually prevails where people live, that is, in the domicile. Dr. Von Ezdorf points out that by such division the chances of infection are greatly reduced, and in case it did occur it would but slightly hamper the intercourse of nations, which modern facilities for travel have made so extensive. Great nations are realizing more and more their dependence upon the seaport for commerce and wealth, and the importance of keeping the ports clean is perfectly obvious.

CHAPTER 3.—MODERN DEVELOPMENTS.

SECTION I.—PREVENTION OF DISEASE.

A "preventable mortality" and "preventable morbidity" are terms used to denote the condition, when all deaths or diseases that can be controlled are avoided.

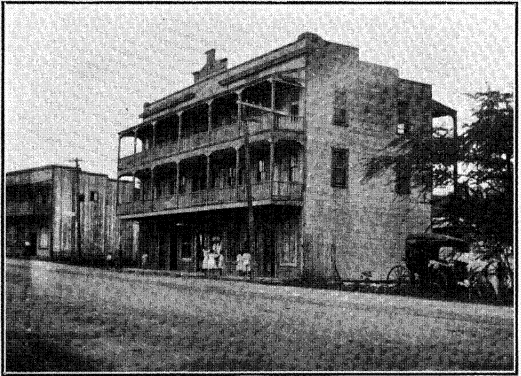
"Preventable" is used to signify the proportion of deaths or sickness that would not occur if the present knowledge of sanitation and hygiene was generally understood and applied by people at large. We can illustrate by scurvy. At one time this disease caused many deaths. It seriously hampered commerce as it frequently occurred on ships. Now that its cause is universally understood, its preventability is practically 100 per cent.

Smallpox can be avoided by vaccination—many still object—and its preventability is rated at 75 per cent.

Typhoid has lately been remarkably controlled by preventive inoculation. It is reported that when twenty-five thousand of our troops assembled on the Mexican frontier, the only person to develop typhoid fever during the summer was a man who refused to be inoculated. The proportion of death and sickness from typhoid will be greatly reduced when this knowledge becomes universal and inoculation general, but at present its preventability is rated at 85 per cent.

Tuberculosis can be wiped out according to experts, but people generally pay so little attention to its cause and spread that the proportion of its preventability is still 75 per cent. When experts

state that 42.3 per cent is the present fraction of preventable deaths in America, it means to 90 given causes of death there has been allotted by experts a percentage of preventability based upon the present knowledge of the cause of the disease and the extent of the acceptance of that knowledge and its application; that their percentages are averaged, and the result is the percentage of all deaths which would be avoided if the knowledge now



TENEMENT NEAR KALIHI PUMPING STATION WHERE CESSPOOL DRAINS INTO STREAM

existing was actually applied in a reasonable way to a reasonable extent.

Thus for our deaths in Honolulu we can reasonably estimate 40 per cent as preventable.

SECTION II.—LIFE CAN BE PROLONGED.

It is obvious that as the ratio of preventability increases, the average length of life must increase. Among the first to perceive this was Edwin Chadwick, a young law student of England. It appears that before a Parliamentary Committee, the official actuary stated in defending the Government Mortality Tables, based

upon the theory that there was a law of life, that "Though the circumstances of the middle classes had improved the expectation of life had not lengthened." This the young lawyer did not think reasonable or logical. He began to investigate, and in 1828 published in the "Westminster Review" an able article demonstrating that environment must have an influence on health; that health must improve when the environment is bettered, and further that many of those circumstances, which were unfavorable to the health of the lives of men, were under man's control and capable of being removed. This was the foundation of modern Sanitary Science, and Chadwick became England's original expert sanitarian.

The first steps taken in Paris toward better sanitary conditions were due to Chadwick. His reputation was such that in 1854 the Emperor, Louis Napoleon, granted him an interview in which he was asked his opinion of Paris and stated, "All that meets the eye is beautiful and much is worthy of imitation, but ——;" the Emperor interrupted the pause with, "all that meets the nose is not so agreeable." Then followed the suggestion for the drainage of Paris, and the interview closed with the suggestion that, as Augustus had boasted "he found Rome bricks and left it marble," so Napoleon III. would find it a greater, wiser, and prouder boast, if in time it could be said that "he found Paris offensively odorous and left it sweet."

Pasteur did for hygiene what Chadwick did for sanitation, when the famous Frenchman stated that "it is within the power of man to rid himself of every parasitic disease."

That the average span of life can be prolonged is now universally admitted. Fisher states that "in Europe the span of life is double that of India—the former is increasing, the latter is stationary."

The figures Fisher gives show that at least fifteen years can be added to human life by the partial elimination of preventable diseases, according to the present stated ratios of preventability, and this takes no account of future medical discoveries. Cancer for instance is put down with zero as the ratio of preventability. Likewise old age has been assumed as unpreventable, yet Metchnikoff, director of the Pasteur Institute, maintains with reason that old age can be prevented and that one result of length-

ening life will be a greater utilization of accumulated experience, and we shall have less immature judgment. He states that "*old age*" at present is practically a useless burden on the community, but will become a period of valuable work.

SECTION III.—LIFE CAN BE STRENGTHENED.

The probable length of life is certain to increase with knowledge and the number that become centenarians greatly increase. But the length of life is only a phase of the results of proper sanitary conditions, as Fisher aptly puts it, "let us conceive another dimension, 'breadth' besides length, and consider 'breadth' as related to the usefulness of life, its vigor, vitality—*length* measured by death (mortality); *breadth* measured by sickness (morbidity)."

Investigation as to the amount of sickness shows that for every death in a community there is a little more than two years serious illness; or, expressed in another way, for each death per annum there are, on an average, two persons constantly sick during the year. In addition there are those who are incapacitated for work, but whose vitality is lowered and whose usefulness is lessened by milder forms of ills not generally considered, and again where the individual is unaware of some functional impairment. The so-called minor ailments will undoubtedly in the next few years receive much more attention than at present.

We have been accustomed to have only acute diseases treated, but as preventive medicine takes the place of curative, we shall treat all the minor ailments. Many of them are but first warnings that something is wrong with the machine. The first twinges of rheumatic pains warn us against gout and more serious conditions. There are, of course, no authentic statistics as to the extent of the minor ailments. They have been estimated as an average of three days' loss of time annually for each person in the community.

SECTION IV.—IGNORANCE AND EDUCATION.

Prof. I. P. Norton, of Yale, has said that there are four great wastes today, the more lamentable because they are unnecessary. They are: Preventable death, preventable sickness, preventable

conditions of low physical and mental efficiency, and *preventable ignorance*.

Education has long been recognized by the American people as essential to their mental progress but they have not yet realized the loss in physical development and the waste due to the lack of knowledge and application of health matters. Our general Government has as yet no health department. We were the only civilized country not represented this summer at the wonderful International Health Exhibition in Germany. Naturally under such circumstances our press gave it scant notice. Professor Fisher, who visited the Exposition, stated that its most impressive feature was the surprise to find the excellence of the exhibits of so many countries—not only of Europe but of South America and Africa.

An example of the expensive results of failure to apply our knowledge of communicable diseases is found in California in relation to Bubonic Plague. When the disease first appeared in San Francisco in 1900, the idea that this Oriental pestilence had invaded the State was strenuously opposed by practically everybody. It is unnecessary to go into details of how the diagnosis was combated and efforts made to conceal the facts. In the meantime the disease gained a foothold among the ground-squirrels of the State, and California is now an endemic focus of plague. It is encouraging, however, to note that the attitude of the people is changing and that now the local authorities and the people are making every effort to exterminate the infection among the rodents.

Whereas, a moderate outlay would have resulted in the eradication of the disease had the people been alive to the importance of the matter in the beginning, it is necessary now to expend about \$250,000 per year and in several years the expense has reached nearly a million dollars.

Education has taught us here in Honolulu the value of publicity, for our experience has shown that the phantoms of imagination are always darker than the truth, and there is nothing to gain and much to lose by false health reports.

The Japanese demonstrated in the Russian war that they are, as a race, awake to the world-wide importance of Sanitation and Hygiene. When the race pride and intelligence of the local

Japanese are appealed to, they will quickly respond. An example was given of this at the time of the civic clean-up day. Inspection prior to that day showed that the Japanese were the first to act and their places were put in good shape.

Dr. McCormack, who visited us last summer as a representative of the American Medical Association, stated that education is the key-note of modern sanitation, that many Boards of Health issued regular bulletins, and Kentucky went so far as to advocate a combined Federal Department of Health and Education. In that state, he said, they taught the school teacher that her salary was not fully earned until the death rate fell in her district. Virginia has published a "Primer of Sanitation and Hygiene," written by the Secretary of the Board of Health, and it is used in all her schools.

One, the most effective, method of combating disease has been illustrated in the tuberculosis campaigns, notably that of Newark, N. J., where the mortality was reduced one-half. The object of the campaign was to interest every resident in the study of tuberculosis. Signs, exhibits, picture shows, gramophone music and lectures were all effectively used to attract and educate.

The National Association for the Study and Prevention of Tuberculosis finds that not only must it distribute information to the masses, but it must also prepare matter exclusively for the press—in every case the leaders of a community must be taught first.

Money is spent lavishly in Hawaii on health measures. They are recognized as a vital necessity. Sometimes it is spent to cure, then again to prevent, but rarely to educate. We are buying our sanitary education in chunks and paying for it in big hunks of experience. We have with jolts and jerks overcome considerable ignorance. Some day we will demand the distribution of a regular supply of health information, constantly spread throughout the community and maintained under a normal pressure. We will then secure more health for all at less expense.

SECTION V.—ASPECTS OF THE LAW.

The Chicago Health Report for 1910 says that the American people are termed a lawless people. A large portion hesitate to obey any law until they have discovered one or both of two things ;

first, whether they can be excused from its operation; second, whether their neighbors are going to obey. This means that the operation of the law is uneven. Too frequently those who are charged with the duty of enforcing the law allow things to drift, and they go from bad to worse until latent public sentiment is aroused.

Public sentiment being accustomed to leniency and unaccustomed to power, strikes out recklessly, even revengefully, and usually illogically. Laws are then enacted, or executive measures taken, without due regard to normal conditions; as a result the aroused public sentiment considers that the situation is cured simply by the enactment of the law or by the promulgation of an executive rule, and the public then failing to support action by its officers the old conditions recur.

The difficulty usually encountered in enforcing health laws and regulations is that so large a percentage of the people will not obey their regulations without question; and the next difficulty is too often inadequate power and a lack of support, if not hostility from public opinion. Many of the more intelligent members of the community by their silence, fail to add "power" when the difficulties increase. The result of this is felt in several ways.

First, it multiplies inspection—instead of one visit either for inspection, direction, or to deliver orders, many are required. In some cases suits have to be started before men will do the simplest things. Before the courts such a man may be excused, when he promises to do that which he should have done months before with a minimum amount of trouble to himself and the health authorities.

Second, the effect is the increased cost of administration. A dollar of expenditure in health work renders much less return than if conditions were different. The amount an inspector can do is cut far below what it should be; the detail of the records increases and with it the office work develops. Litigation costs the time of lawyers, inspectors, doctors, judges, witnesses and court attaches. Fines and costs never remunerate for the loss of time occasioned by reinspection, clerical services, supervision, witness fees, legal and court services. Dollars in our community are not so plentiful that they can be expended with such waste.

Third, it tends to inefficiency in the health service, because standards are lowered and the service is discouraged.

Fourth, and the most important effect is, that progress in improving the health of the community is checked.

There appears to be only one way to correct this condition and that is to secure an active participating interest of all classes in health conditions and an equal and prompt acceptance of health regulations.

The Board of Health operates under what is called the police power. This is the right of the community to have that done which is required to protect its health, its morals, and its safety. It is a fundamental power for the protection of society. In extreme cases individuals, or groups, reassume the power of self-protection and exercise it personally and public sentiment condones their acts.

It is now conceded that, if a man has smallpox, he can be deprived of his liberty without trial by jury, and property can be destroyed summarily, if that property is a public menace and delay would be dangerous to the public.

The rights of the people along these lines are inalienable. There is an old Roman adage: "That the health of the people is the supreme law." All laws or regulations based on police power must conform to two basic requirements:

- 1st. The situation to be met must be genuine and of sufficient importance.
- 2d. The operation of the law must not unreasonably interfere with liberty or rights of property, or work discriminatively.

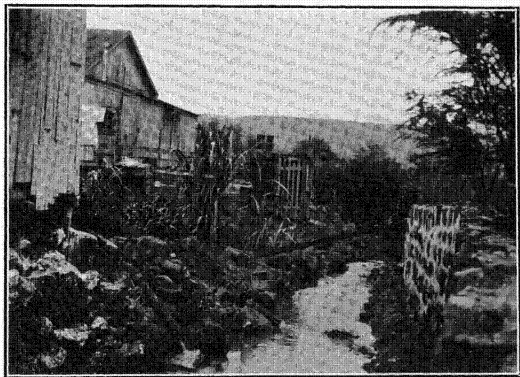
To say that vaccination should only be done in time of epidemic is no more an accepted opinion, than to say that laws requiring buildings to be fire-proof should only be operative during a fire—both logical but poor law. The difficulty too often is that we do not see the community view-point, because our point of view, our method of approach to any subject is so intensely individualistic.

The habit of looking on the community side is a growing one, and we are just beginning to see that in health matters the liberty of the individual to do as he pleases too often ignores the common welfare.

CHAPTER 4.—STUDY OF DISEASE.

SECTION I.—ESSENTIAL CONDITIONS.

In order that any tropical disease should develop in a given region three essentials, in addition to the climatic conditions, must be present; *first*, the cause of the disease; *second*, the proper transmitting agent; *third*, the susceptible individual.



SHOWING DISCHARGE PIPE FROM CESSPOOL OF TENEMENT NEAR KALIHU PUMPING STATION.

Our climatic conditions are favorable, the cause of the disease may be here, and we may have the susceptible individual; but, if the transmitting agent is absent, the disease will not develop. This is our situation in regard to malaria. We lack the proper transmitting agent—the *Anopheles* mosquito. If, however, it is introduced an epidemic is certain to occur and perhaps this costly disease become endemic. There are thirty-two species of *Anopheles* mosquitoes, seven of these have definitely been shown to carry malaria. Both the transmitting agent and the disease exists,

on one side of us in the Philippines, and on the other side of us in Central America, Mexico and Texas.

Again the transmitting agent may be here, with the susceptible individual, but the cause of the disease—the individual harboring the parasite may be absent and the disease undeveloped. This is our condition in regard to “yellow fever” and “elephantiasis,” both mosquito borne; the former known to be transmitted by one species of the *Stegomyia*, and the latter by our common variety of the *Culex*. Yellow fever is bound to be introduced from the various parts of South and Central America, if not Mexico, and elephantiasis may make its appearance here at any time, as it is already in Samoa.

SECTION II.—CAUSE AND CLASSIFICATION.

Turning now to the obviously external causes of disease, environmental, those with which sanitation chiefly deals, let us pass over those caused plainly by external origin, which are chemical, mechanical and physical, accidental or otherwise—such as being crushed, drowned, suffocated, wounded or executed, and leaving another group of obviously external causes of disease, those from poisons due to external causes which may be grouped together under the head of living agents of disease or parasites, including not only the larger and more common parasites such as tapeworm, fleas, ticks, lice and mosquitoes, but also those far more elusive, the micro organisms, bacteria or germs.

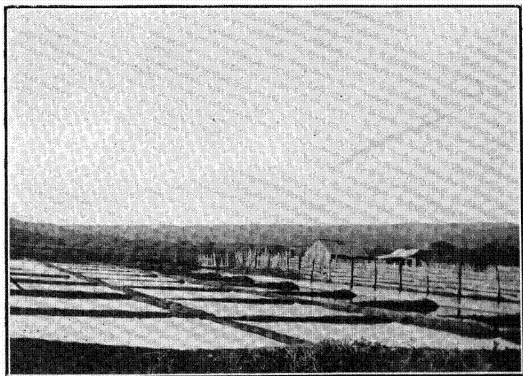
Prof. Henry B. Ward, of the University of Nebraska, defines “parasites” as any organisms which obtain their nourishment at the expense of some other living thing. They may be plants or animals. Parasites do not originate in vitiated organs nor are they the result of temperament. They are introduced into or upon the body by the host from without. Methods of cure, he states, depend upon the removal of the parasite and prevention of further introduction.

For our purpose due to “the grave and increasing danger of the introduction and spread of contagious and infectious diseases,” we prefer to classify all such diseases in three simple divisions: 1st, those obtained through the mouth; 2d, those received by contact; 3d, those spread by insects.

CHAPTER 5.—OUR DEFENSE.

SECTION I.—THE MOUTH.

Diseases which reach us through the mouth, such as typhoid, cholera, and dysentery, can be prevented by having pure water, clean food and an adequate sewerage system, and by exterminating the housefly.



SALT PONDS AT MOUTH OF KALIHU STREAM INTO WHICH THE CONTAMINATED WATER FROM CESSPOOLS AND SLAUGHTERHOUSES MUST FIND ITS WAY BEFORE THE SALT IS SOLD

To aid and secure this defense it is essential to study the conditions in regard to our sewers; the source of our water supply, its purity and freedom from infection; the protection of the catchment basins and storage reservoirs; and the avoidance of the common drinking cup.

Buy no meat, fish, vegetables, fruit, milk or ice that is not certain to be fresh, clean, and pure.

Patronize only those who screen their foodstuffs from flies.

Investigate how the vegetables you use are cultivated, and where they are washed.

Patronize restaurants where both the kitchens and dining rooms are screened, and where only boiled or distilled drinking water is served.

Insist that flies are an unnecessary nuisance, and remember that their source is usually stable manure.

SECTION II.—CONTACT.

Diseases that we take by contact, such as tuberculosis, leprosy, smallpox, and measles can best be guarded against by enforced ventilation, better living conditions, avoidance of over-crowding and school infection, with education of the masses as to the mode of their spread.

This defense we can aid by living only where the light can penetrate and where there is at least 400 cu. ft. of air space for each person; by reporting landlords, who offer for rent dark, damp, dirty rooms, and by studying our own living conditions, if ill, to see how we can save others from contagion and infection.

SECTION III.—INSECTS.

In diseases spread by insects, such as plague, cholera, yellow fever and dengue, our defense depends on the extermination of the transmitting agent—rats and their fleas, and mosquitoes of all kinds.

To aid this defense each one can help the rat campaign “to build the rat out of existence,” to destroy and remove his breeding places, starve, poison and kill him. See that refuse and swill neither protect nor feed him, that grain and feed are out of his reach. Rat harbors are wooden sidewalks, attics, piles of brush and kindling wood, old barrels and lumber. Boarded or closely-latticed places under houses offer a fine refuge. We should see that they are removed or so adjusted that under the house the rat will not longer feel safe from his enemies.

We should help the mosquito campaign by destroying and removing all breeding places—first around and then at a distance from habitations. Any standing water is apt to be a breeding place, if the mosquito can reach it. The contents of ponds, water-

tanks, flowerpots, water troughs for animals or chickens, spots that are continually damp and muddy, water holding plants, defective drains and gutters, empty cans, bottles, hollow stumps and trees or branches that hold water are all sources of danger in that the mosquito will find water in them. Running water, when crowded with grasses or water-plants, furnishes quiet places in which mosquitoes can breed. Streams that are intermittent in their flow, leaving hollows and pools, should be paved.

SECTION IV.—KNOWLEDGE.

Finally the surest defense is knowledge. When men know the cause of disease and the reason for premature death, then that knowledge will bring with it the public support that is essential to protect ourselves from an environment that causes suffering, loss and waste.

It is not sufficient for experts to know the cause of disease and the methods of its spread, but the people at large must be instructed so that disease appearing anywhere may be restricted to its place of origin and there confined and exterminated.

SECTION V.—FEDERAL QUARANTINE.

One great bulwark of defense is the protection afforded by the Public Health and Marine Hospital Service. The laws and regulations of this service, in so far as they relate to the Territory of Hawaii, may be summarized as follows:

I. The service has medical officers in all foreign ports considered dangerous from the standpoint of health, and these officers enforce certain regulations to insure that every precaution is taken at the point of departure against the introduction of quarantinable diseases. The same medical officers also inspect aliens destined for the United States to ascertain if they are suffering from certain "loathsome contagious diseases" or "dangerous contagious diseases," other than those called "quarantinable diseases." There are only six "quarantinable diseases" under these regulations, viz., typhus, leprosy, cholera, plague, smallpox, and yellow fever.

The diseases considered "loathsome contagious" are such as excite abhorrence in others by reason of the knowledge of their

existence. The term "contagious" should be regarded as synonymous with "communicable." Examples of "loathsome contagious" are: Trachoma, filariasis, hookworm, and amoebic dysentery.

II. On arriving at an American port of destination vessels of the following classes are subject to inspection by a medical officer of the service:

- (a) All vessels from foreign ports.
- (b) Any vessel with sickness on board.
- (c) Vessels from domestic ports where cholera, plague, or yellow fever prevails, or where smallpox or typhus fever prevails in epidemics.

If the officer making this inspection discovers a case of "quarantinable disease" or a condition aboard the vessel which he considers liable to convey "quarantinable disease," the vessel and its personnel together, or the vessel alone, or certain parts of its personnel, as the case may be, are placed in quarantine. If on the other hand he finds none of the six "quarantinable diseases," he only certifies to this fact and turns the certificate over to the United States Immigration Service. That service either holds the infected individual until cured by treatment, or, if this is not practical, deports the individual to his or her country.

In addition to the above, such diseases as scarlet fever, diphtheria, measles, whooping cough, etc., when discovered aboard are required to be reported to the local authorities in order that the latter may intercept the infected passenger and adopt such precautions as they may consider necessary.

III. When Honolulu suffers from an outbreak of a quarantinable disease, the officer here, in order to protect other American ports, is required to put in force certain regulations commonly known as "outgoing quarantine."

In addition to the foregoing duties prescribed by regulation, the Service here, in conjunction with the Board of Health, makes a bacteriological examination of all rats captured by trappers of our Board, and reports weekly the results.

Efficient as this Service is, the protection at best can only be partial, for absolute safety can only be had by prohibiting commerce.

The Service aims to facilitate commerce in every way compatible with its duty.

It must be evident that much remains to be done by local authority when the Federal Service simply reports measles, scarlet fever, and whooping cough, and does not touch malaria.

PART II.—DESCRIPTIVE.

CHAPTER 6.—BOARD OF HEALTH.

SECTION I.—EARLY HISTORY.

The earliest known record of any public action for the protection of health in these Islands is a little, single, printed sheet,



SPRING IN TARO PATCH FROM WHICH IT IS SAID PEOPLE GET WATER FOR DOMESTIC USE

which can be seen in the archives, dated at Waikiki, August 1, 1836, and signed by Kinau, Auhea, and Paki.

It is a notice to the Pilot of Honolulu, forbidding him to board

vessels until he has ascertained their condition of health. If infected with smallpox, the vessel is to anchor and fly a yellow flag. The notice states that: "Any neglect of these regulations will be severely dealt with, and vessels not conforming will be driven from our shores."

On May 29, 1839, the King by proclamation provided for a Board of Health of three persons for each harbor, to be appointed by the respective Governors of the Islands, whose duty it was to enforce quarantine regulations against smallpox then prevalent on ships in the Pacific. This proclamation is also to be found in the archives. It is a little pamphlet printed at Lahainaluna.

The first Constitution was promulgated October 8, 1840, and the first Compilation of Laws was published in 1842. By them the right to quarantine vessels and passengers was established, and, for the purpose of carrying out these laws, a Board of Health for each harbor was created, consisting of five health officers, including the port physician and the pilot. This Board was given (1st) control of vessels in quarantine; (2d) power to establish laws over all people in time of danger from sickness; and (3d) the duty of devising plans to prevent the introduction of contagious and other diseases.

The laws organizing the Executive Departments, printed in 1846, do not mention health, except in relation to the quarantine of vessels.

It was not until 1850 that any official action was taken for the internal regulation of health. On December 4th of that year, the King empowered T. C. B. Rooke, George A. Lathrop, M. D.; B. F. Hardy, G. W. Hunter, E. Hoffman, M. D.; R. H. Smith, and W. Newcomb as a Board of Health, and asked them to prepare suggestions as to laws and regulations. These were submitted to the King in Privy Council on December 16th, and were accepted, approved and enacted. This Board of seven was self-perpetuating. It had power to make regulations not contrary to law, to examine and report nuisances, to appoint physicians for contagious epidemics, to quarantine, to move patients, and to dispense relief.

In May, 1851, the Legislature approved the health laws as passed by the Privy Council. This Act prohibited burials within

the city, required reports by householders of malignant disease within twenty-four hours, and required the Board of Health in times of pestilence to report each week for publication. The Board, however, had no funds, nor was there any other means of enforcing the law.

The Constitution of June 4, 1852, does not mention public health and it probably repealed the former law. The Legislature of 1852 made the first appropriation, as far as can be ascertained, for public health, granting to the Department of Education \$500 per annum for the purchase of medicines to be distributed to poor Hawaiians.

R. Armstrong, Minister of Public Instruction, in his report (page 65) of April 6, 1853, states that "the Legislature seems to connect health with education for it provides \$500 for free medicine." "This," he states, "was paid to the Agent of the Mission, which had expended in 1852 about \$1,000 for free medicines. Owing to a change in their plans this will be discontinued, and there will be much suffering and loss of life, if the natives are left to their own remedies." Armstrong states that "a hospital and dispensary have been often strongly recommended by physicians, some of whom offer their time gratuitously, and no doubt such a plan would work incalculable good." He further says: "Our quarantine laws need revision, as late experience with smallpox shows necessity for better sanitation. There should be some provision for paupers, particularly those insane, deaf, dumb and blind."

On May 16, 1853, the Legislature passed an Act relating to public health. Its preamble stated that "smallpox is supposed to exist." This provided for a Health Commission of three, without pay, granted them all the powers contained in the Act of May, 1851, and gave authority over all sick, and power to provide medical attendance, food, lodging and clothes at Government expense. It provided for publishing their regulations and enforcing them by fines, and gave authority to draw necessary funds from the Public Treasury.

On the same day the King appointed G. P. Judd, T. C. B. Rooke, and W. C. Parke, members of the Health Commission. Three months later, Dr. Judd, the Minister of Finance, resigned.

The report of the Health Commission, dated September 12,

1853, and signed by H. R. H. Liholiho, Rooke, and Parke, is the first Health Report to be found. It is a manuscript on file in the archives.

At the next Session of the Legislature in 1854, John Young, Minister of the Interior, reported that "the Commission on Public Health will present their report on smallpox, to combat which they were appointed." "That the appropriation of \$10,000 has been exhausted and \$20,000 additional expended." He recommended careful revision of the law, "so as to make permanent provision against pestilence."

On March 20, 1854, appeared the first printed Health Report that can be found in the archives. It is signed by the same three Commissioners of Health as the report of the September previous, and is submitted to the Legislature with their resignations.

On August 10, 1854, an Act was passed making vaccination compulsory.

December 15, 1854, the King died and on January 11, 1855, Alexander Liholiho ascended the throne as Kamehameha IV.

February 25, 1855, H. R. H. Prince Lot Kamehameha, acting Minister of the Interior for John Young, reported difficulty with the virus obtained through the philanthropy of the British Consul, and that compulsory vaccination had not had a fair trial. The Minister of Finance reported \$800 spent in vaccination on Hawaii and Maui during 1854.

On May 25, 1855, an Act was passed providing for the establishment of hospitals for the care of indigent sick persons, and for instruction in nursing, and \$5,000 was appropriated for this purpose, but nothing appears to have been done.

June 25, 1855, a new Act was passed relating to the Public Health. This time a Board of three was created, who were charged with the oversight and care of the public health. They were for the first time required to keep a record of their proceedings, and were given very general powers, among which was that of drawing the funds they needed by drafts on the Minister of Finance to be accompanied by a statement of accounts and vouchers. They were also authorized to use the labor of prisoners. This Legislature made a grant of money for vaccination on all the Islands and for the first time provided \$500 for coroner's inquests, but made no other provision for the Board of Health.

The Minister of the Interior's report to the Legislature of 1856 contains the report of the Board of Health which states that, beyond passing a few resolutions, the Board was unable to carry on its work, for the Minister of Finance, Elisha H. Allen, refused to advance money for its use. Financial reports show there was expended \$2,733.65 in vaccination and \$141.65 for coroners.

This Legislature made the first specific appropriation for the general expenses of the Board—\$1,000—but it could not be used because of the law requiring vouchers in advance. Vaccination and coroner's inquests were provided for by small appropriations.

Unfortunately the minutes of the Board of Health as organized by the Act of June, 1855, are lost. The oldest record book now in the possession of the Board begins with the minutes of a meeting on January 1, 1858, which stated that the minutes of the preceding year were read and approved.

The resignation of the Commission in 1854 had evidently been ignored, for we find Messrs. Rooke and Parke signing a health report to the Legislature of 1858, addressed to H. R. H. Lot Kamehameha, then Minister of the Interior as well as President of the Board of Health. This report was printed with that of the Minister of the Interior in 1858. It stated that a few nuisances were abated, where owners were willing, that there had been no epidemics although some alarm had been felt over typhus fever; that requests for labor and money had been refused, therefore the Board recommended a revision of the law, "granting greater power or permitting less supervision." The Board stated that the only asylum for the insane was the jail; that sick or disabled seamen had no care, and urged the establishment of a hospital.

At the same time the report of the Minister of the Interior urged the appointment of a Sanitary Commission and a stricter regard for the preservation of life by affording proper facilities for the prevention of disease.

A new Civil Code was under preparation and on May 17, 1859, it was finally passed to take effect August 1st. The chapter on public health reenacted the former law, adding the prohibition of the practice of medicine by foreigners, except after examination and evidence of good moral character. It also provided a penalty for the violation of any regulations by a fine of not to exceed \$100.

The Code of 1859 gave the Board the regulation of nuisances

and filth; control of sickness on shore or on vessels; authority over the interment of the dead and cemeteries, and power to quarantine. It granted power to enter private property in order to examine the same, to order the removal of nuisances in 48 hours, and to act, if the owners failed, charging the expense to the owners. It provided another course of action through the courts as to "common nuisances injurious to the public health," upon conviction, it being discretionary with the court to order removal under the direction of the Board or to punish by fine. The Code also required that "all regulations must be published" and it was the duty of the police to report nuisances. Physicians were then for the first time required to report dangerous diseases *in writing*. The Code also granted the Minister of the Interior power to establish hospitals on each Island, as had been done by the Act of 1855. The Code also regulated the sale of opium and other drugs by requiring licenses to import and sell the same.

This Session of the Legislature also enacted a law providing for a hospital in Honolulu and granted land to the value of \$5,000, such grant becoming effective when the hospital should have \$5,000 in funds. This was approved April 20, 1859, and on June 16, 1859, a charter was granted to the Queen's Hospital.

Another Act, that of May 13, 1859, prescribed a tax of \$2.00 a head on all foreign passengers that might land in order to pay the hospital expenses of sick and disabled Hawaiian seamen. The first financial report for the year 1859 showed a payment in support of the Queen's Hospital of \$2,000, with a continuation of appropriations for vaccination and coroner's inquests.

The Legislature of 1860 received from the Minister of the Interior the usual report included in which is Secretary McKibbin's report of the work of the Board of Health. The Minister of Interior commented on the Board's need of money, and recommended increasing the membership of the Board from three to five by the addition of two medical practitioners.

The health report of May, 1860, stated that regular meetings had been held and medical examiners appointed, and that licenses to practice medicine had been issued by the Minister of the Interior. Regulations were published in the "Polynesian" and the "Hae Hawaii," and a new function taken up, to wit, the control of markets, curing hides, and slaughter houses, the latter re-

moved from town, as well as the regulation of privies and cess-pools. The keeping of pigs within the city had been forbidden and densely crowded premises or filthy locations inspected.

On August 26, 1860, the Act to mitigate the evils of prostitution was passed and an appropriation of \$4,000 was made for its enforcement, and on August 28, 1860, an Act was passed increasing the Board from three to five, two to be medical men.

The Legislature of 1860 provided the usual biennial funds, covering items heretofore mentioned, i. e., vaccination, free medicines and coroner's inquests, and new items of \$4,000 for the support of the Queen's Hospital and of \$300 for the general expense of the Health Commission and the removal of nuisances.

This was the first appropriation made for the expenses of the Board of Health—the result of ten years' constant effort on the part of those who were serving without pay, wholly in the interests of their fellow citizens. The total biennial appropriations for health measures were \$7,400 out of the estimated receipts for two years of \$66,626, or slightly over 10 per cent.

Minutes of the meeting held January 23, 1861, show Lot Kamehameha, President, and the following four members: W. C. Parke, J. I. Dowsett, Dr. William Hillebrand and Dr. R. McKibbin.

In 1862 the Legislature received the first report from the Queen's Hospital. The opium licenses were said to be satisfactory, and the Act to mitigate prostitution practicable. Agents for the free distribution of medicine had been appointed. This report shows that on December 20, 1860, the first epidemic of measles appeared, causing an expenditure of \$147.50.

On August 23, 1862, an Act was passed to establish an Insane Asylum and provision was made for its execution by an appropriation of \$7,000.

On August 23 in the same year, the first Sanitary Commission in these Islands was created, consisting of five persons appointed by joint resolution of the Legislature to investigate sanitary conditions and causes of depopulation. The King in Privy Council, September 16, appointed the following: Prince Lot Kamehameha and Dr. Wm. Hillebrand, of Honolulu; Dr. F. W. Hutchinson, of Lahaina; Dr. J. W. Smith, of Kauai, and Judge Wight of Kohala. (No report can be found.)

On November 30, 1863, Kamehameha IV. died and Prince Lot was proclaimed King as Kamehameha V.

Late in December of that year the Board was reorganized, under the new President, G. M. Robertson, Minister of the Interior, with the following members: Dr. William Hillebrand, Dr. Stangenwald, T. C. Heuck, and the first Hawaiian to serve, A. M. Kahalewai.

On January 7, 1864, the Board passed the first official regulations governing the burial of the dead.

At a meeting held February 10th, the minutes show the first recorded discussion of leprosy.

On August 20, 1864, a new Constitution was proclaimed.

G. M. Robertson was succeeded as President on February 18, 1864, by C. G. Hopkins.

On January 23, 1865, an Act was passed to prevent the spread of Leprosy. The passage of this Act so profoundly affected all future health matters that we shall treat the subject of leprosy under a special heading. Seven days later another Act was passed making the Minister of the Interior President of the Board of Health, and requiring that two members at least be from the Privy Council and two members at least be medical practitioners. At a meeting held July 18, 1865, C. de Varigny was acting as President, owing to the illness of the Minister of the Interior, F. W. Hutchinson. In 1865 came the first law regarding mortality statistics. Heretofore certain statistics had been gathered by the Department of Education.

In 1866 appeared the first regular, separate, printed report of the Board of Health, and these have continued to appear ever since. President F. W. Hutchinson gave a statement of expenditures for two years ending March 31, 1866, as follows:

Leprosy	\$16,012.84
Smallpox	2,047.84
Dispensaries	5,348.87
Coroner's inquests	51.50
<hr/>	
Total	\$23,461.05

The Legislature in its Session of 1866 provided a single health appropriation of \$20,000 for the next two years.

The report for 1868 showed the appointment of physicians wherever possible to look after the poor Hawaiians. Dr. Hutchinson stated that the steamers then established would increase the danger of contagion and that there was need of both law and equipment for quarantine.

The year 1868 saw the establishment of an exclusive Hawaiian Board of Health in order to control the Kahunas and the passage of the first law controlling the sale of poisons.

During 1870 concurrent jurisdiction was granted to both the Supreme and Circuit Courts in the cases involving the abatement of nuisances, and the same law provided that all orders in such cases were to provide penalties, fix time for abatement, and costs. The appropriations for health included those for the support of the insane, leper settlement, traveling physicians, for free medicine, and for aid to the Queen's Hospital, and they amounted to about 7 per cent of all the appropriations made.

In 1872 it was found necessary to amend the Act of 1868 Regulating the Sale of Poisons to include the "wooden containers used."

January 1, 1873, Lunalilo was elected King as provided by the Constitution, but his reign was short, his death occurring January 18, 1874. During this period E. O. Hall was President of the Board of Health.

Lunalilo was succeeded by Kalakaua on February 14, 1874, who appointed H. A. Widemann as President of the Board of Health, and he was succeeded by S. G. Wilder, who in turn gave way to J. Mott-Smith on December 5, 1876.

The session of 1876 changed the laws, likewise the membership of the Board of Health, making a Board of five, one to be President and three were to be members of the King's Privy Council, all to serve without pay. This Act empowered the Board to spend during times of pestilence moneys set aside for its use by the Privy Council.

The report of 1876 shows expenditures for leprosy, the care of the insane, to enforce the "Act to Mitigate," for traveling physicians, free medicines, quarantine against measles, and for general expenses.

The total appropriations for health were \$55,000 per annum, or about 10 per cent of the total of the Government expenditures.

In 1876 the vital statistics of Honolulu District were begun and the cause of death first recorded.

President Mott-Smith started the Makiki Cemetery for Hawaiians in June of 1877.

The Health Report of 1880 signed by S. G. Wilder, President, recommended a better water supply, a sewer system, and the control of wash-houses. He gave no general statement of expenditures, although the appropriation for the year ending March 31, 1880, for health was \$66,500, and covered the leper settlement, traveling physicians, medical supplies, general expenses, quarantine building, care of the insane, aid to the Queen's Hospital, and medical instruction for Hawaiians.

The Health Report of 1882 was made by W. N. Armstrong, as President. J. H. Brown, Health Agent, desired authority to drain the surface water and stagnant pools and to cut new streets.

In 1884 W. M. Gibson became President, and after the new Constitution of 1887 was promulgated was succeeded by Dr. G. Trousseau, who in turn was succeeded by Dr. N. B. Emerson on September 17, 1887. A special session of the Legislature in 1888 for the first time regulated the sale of alcohol. The free treatment of natives by Government physicians was begun in 1884 and abolished in 1888.

On January 1, 1890, Dr. J. H. Kimball succeeded Dr. Emerson as President. In his report the free dispensary established under President Wilder in 1880, the need of sewage disposal, and of better water and less waste are commented upon. In 1890 the first sanitary inspection was undertaken. The expenditures for the two years ending March 31, 1890, were:

Settlement	\$239,342.40
Hospitals	41,855.00
Free Medicines	9,408.26
Physicians	39,685.31
Quarantine	3,997.59
General Expenses	32,935.25
<hr/>	
Total	\$367,223.81

The appropriations made in 1890 for health were \$497,191.20

out of a total of \$4,870,161.08 for two years, or slightly over 10 per cent.

In 1890 a law was passed placing the licensing of hotels and victualing houses under the control of the Board of Health, while another law provided that lodging and tenement houses should secure licenses from the Board also.

In 1892 the enforcement of the Act to Mitigate the Evils of Prostitution was turned over to the Board of Health by the Department of the Interior, and in order to suppress cholera, the Minister of Finance, on request of the Board of Health, was given power to close all ports except Honolulu.

January 17, 1893, brought the downfall of the Monarchy and the establishment of the Provisional Government with its Executive Council to administer executive affairs, and its Advisory Council to legislate. On February 23, 1893, the Board of Health laws were again amended so as to make the Board consist of seven members—three laymen, three physicians, and the Attorney General—all to be appointed by the President with the approval of the Executive Council, to be commissioned for two years, subject to removal by the Minister of the Interior with the consent of the Executive Council, and all to serve without pay. The Board was to elect its own President, and in his absence might select a presiding officer.

The Provisional Government in 1893 made appropriations for two years ending March 31, 1896, of \$2,097,246.67 out of which nearly 17 per cent was for health—\$360,452.40.

On July 3, 1894, the Constitution of the Republic of Hawaii was proclaimed to take effect the following day. Under it the Council of State could appropriate money between sessions of the Legislature, during pestilence, or in case of great public necessity, and the President with the approval of the Cabinet was authorized to appoint the Board of Health.

In 1895 the first great epidemic of cholera occurred, which we have treated elsewhere.

The Legislature of 1896 passed many laws improving health conditions. The fire limits were extended, mortality statistics improved, the practice of medicine better defined, a law for unsanitary land passed, and laws requiring licenses for tenements, milk and drugs renewed and changed.

The Legislature of 1898 passed the first pure food law providing a commissioner whose duty it was to enforce the law.

In June of 1900 annexation to the United States was completed. W. O. Smith resigned as President of the Board of Health and H. E. Cooper succeeded him both as Attorney General and the first President of the Board of Health of the Territory of Hawaii.

Not until 1903 were the health laws amended. Then on April 28, a law was passed again changing the make-up of the Board, by reducing the necessary number of physicians from three to two, so that the Board consisted of seven members, four of them laymen, two physicians, and the Attorney General, *ex officio*.

In 1905 an act was passed permitting the practice of osteopathy and another requiring certain health regulations to be first approved by the Governor.

In 1907 the laws concerning the organization of the Board of Health were not changed, but a number of laws relating to health matters were passed.

The Legislature of 1909 passed an act making it legal for the President of the Board of Health, with the approval of the Governor, to designate some other officer in the department to act during his temporary absence or illness. All statutes attempting the control of the manufacture of poi were repealed. The statute respecting vaccination was amended so as to require the presence of parents or their written consent before vaccination could be made, and the law requiring school children to be vaccinated before attendance at school was repealed. The law regulating the collection of vital statistics was also amended and improved.

The 1911 Legislature passed a new statute governing the conditions under which poi can be manufactured, and the first law to check the spread of tuberculosis, as well as a statute requiring a license for the manufacture of food products.

We touch elsewhere on the change of laws in regard to nuisances and causes of sickness, as well as those affecting leprosy and the drainage of unsanitary lands.

Since annexation, in 1900, there has been more serious invasion of disease than during any other period of the same length, but thanks to the efficiency of both the Federal and local authorities, contagion and infection have been held in check.

The health reports during this period make good reading for those who believe that affliction and pestilence are beyond control.

SECTION II.—GREAT EPIDEMICS.

The earliest recorded disease that became serious enough to note as a great epidemic was the pestilence of 1805 known as "mai okuu" which broke out at the time Kamehameha I gathered together his troops to invade Kauai. Professor Alexander



BATH HOUSE OVER DITCH WHERE CUSPIDORS AND CHAMBERS ARE WASHED
AND BOYS PLAY

states that "Kamehameha himself was attacked but recovered." All his chief counselors perished except Kalanimoku. Many believed this to be cholera.

The smallpox of 1853 was severe. Out of a population of 19,126 on the Island of Oahu there were 9,082 cases and 5,748 deaths. The same proportion now would mean 17,361 deaths on Oahu during nine months time. The direct cost was \$30,115.87 at a period when the total revenue of the whole Kingdom was only \$312,699.07. The mortality of the Islands was 109.7 per 1,000.

The health report for 1870 shows a serious epidemic of fever. The population had been steadily decreasing and the death rate increasing until in 1869 it was 58.9, jumping to 64.8 in the next year. Dr. Stover of Maui wrote on April 18, 1870: "The plague (?) which is decimating the natives on this Island is 'scarlatina anginosa' but there are other cases which I have denominated 'acute fever,' not contagious but extremely prevalent and very many die of it. The mortality on the Island is shocking. I never knew until now that people could die so easily or with so much indifference."

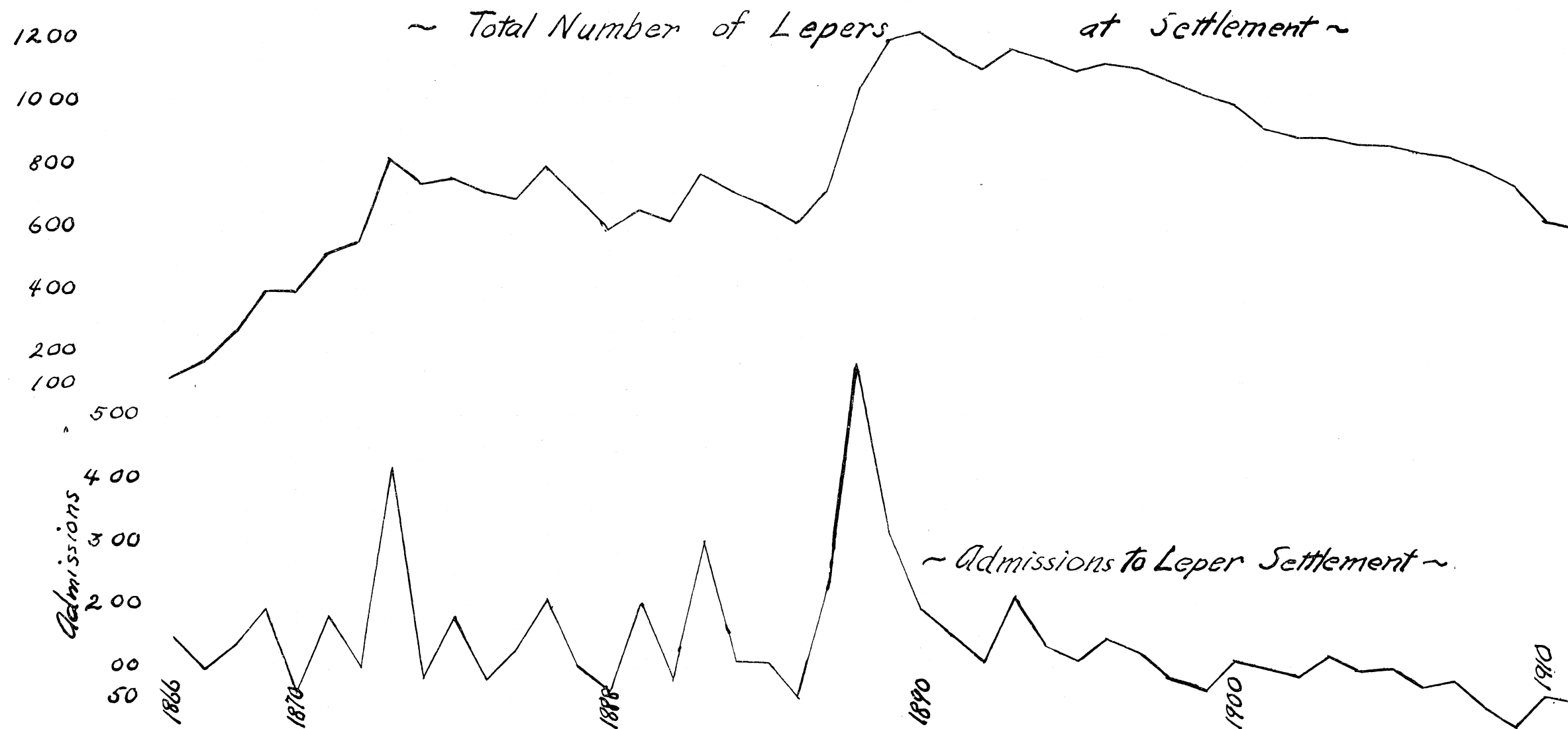
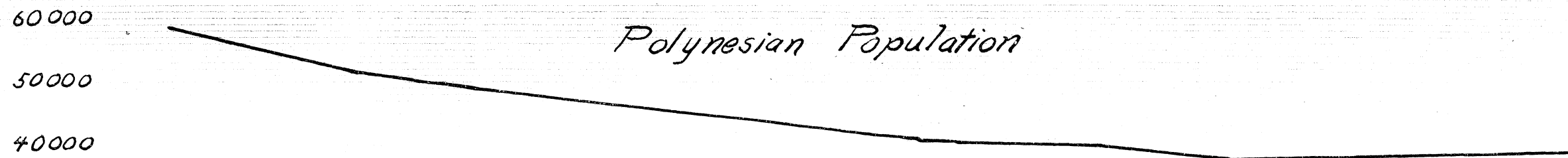
In 1880 there were 196 deaths from fever. Typhoid was so prevalent that the Board of Health summoned all of the physicians from the whole group to a conference. Measles was again very prevalent, having first caused trouble in 1860.

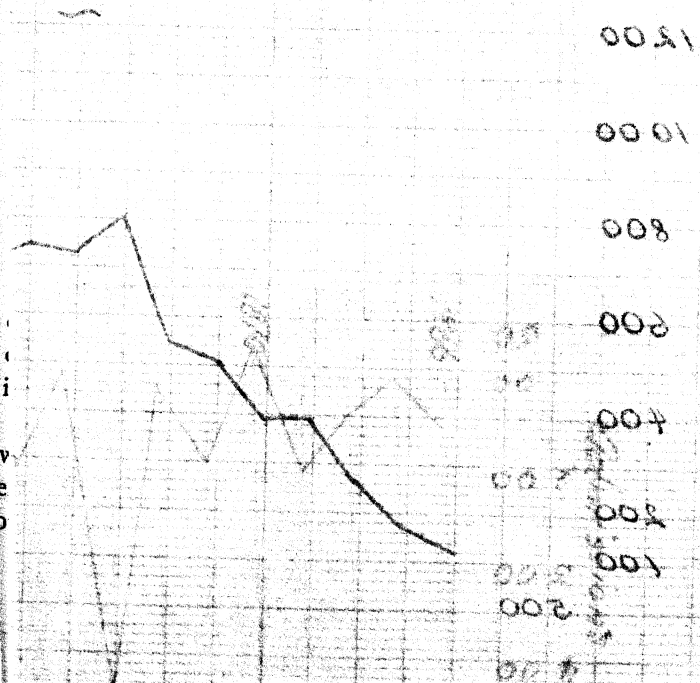
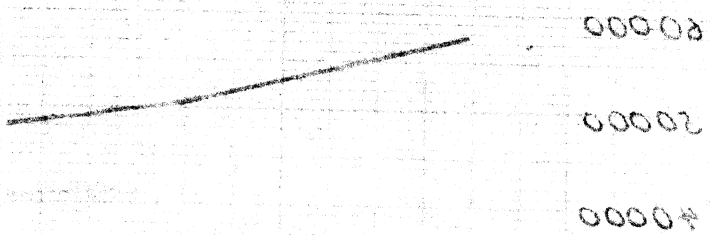
Smallpox again became epidemic in 1881, complicated because of the large number of infected Chinese immigrants constantly arriving. More than 5,000 people were maintained in quarantine and over 1,000 guards employed. There were 780 cases with 282 deaths. The net cost or direct loss was \$98,698.36.

In 1888 measles again broke out, followed by dysentery. Dr. Kimball reported that measles, in nearly all cases, was of a mild type, but unfortunately it broke out just before the rainy season which was remarkable for the heavy rainfall and the long continued prevalence of southerly winds. Dysentery prevailed as a primary disease and also as a very marked sequel to measles. Many deaths occurred, especially among the natives.

During August and September of 1895, Hawaii had its first experience with cholera. The first case was reported by Dr. H. V. Murray on August 20th. In all there were 87 cases and 64 deaths. It was undoubtedly brought here by the s. s. "Belgic" which arrived on August 9th. The direct cost of this epidemic was \$61,697.55, the population being 28,061. A volunteer citizens' committee aided the health authorities by establishing complete daily inspection and a special report was printed in 1896 showing in detail the work done in controlling and checking this scourge.

On December 12, 1899, occurred the first case of Asiatic plague, which soon became epidemic and proved one of the most costly experiences Honolulu has undergone. There has never been a published report. The direct cost was \$625,000. There were 71





cases. Every house in which a case occurred was burned. Finally by accident a great fire took place, due to which claims were finally paid amounting to \$1,315,000.

Since then plague has been sporadic.

SECTION III.—LEPROSY.

In April, 1863, Dr. Hillebrand, surgeon of the Queen's Hospital, called attention to the spread of a new disease, called by the natives "Mai Pake," "Chinese disease." Dr. Hillebrand claimed that it was the "genuine Oriental leprosy."

In December, 1863, the Board of Health met and discussed the "Mai Pake" menace but took no action. In February, 1864, however, learning of the spread of the disease, a resolution was adopted on the 10th whereby a census was taken of the cases in and about Honolulu in order to later have them examined. In the following May, the Board regretted that the census had not been taken.

August 10, 1864, the subject of leprosy was again brought before the Board, and its spread among the people reported upon.

On January 3, 1865, the Legislature passed an Act to prevent the spread of leprosy. There were seven sections. The first two authorized acquiring suitable land for an "isolated settlement." Section iii. gave the Board of Health authority to confine those afflicted; Section iv. provided for a hospital to treat incipient cases. Section v. made it possible to require labor of those confined and authorized rules and regulations to govern lepers. Section vi. made the property of lepers liable for the expenses of their confinement. Section vii. required the health authorities to keep accounts of expenditures for leprosy separate from other matters and report them in detail to the Legislature, with such other information regarding leprosy as was deemed of public interest.

In 1866, Dr. Hutchinson, President of the Board of Health, under the foregoing law prepared a seven-page, printed report for the Legislature. This shows that his predecessor had purchased land in Palolo Valley for \$1,000. Objection was made to this location, and the selection turned to Kalihi, on the stream below the valley, at a cost of \$665, for a Leprosy Hospital and Receiving Station. At the same time land on the north side of Molokai

was acquired by purchase and exchange for a large settlement of incurables.

The best information indicated a total of 275 cases in the whole group of Islands. On being summoned to present themselves for examination, a much larger number appeared than was anticipated and many names were added to the list of those heretofore known on this Island. At the time of this report, March of 1866, the examination of Oahu was finished, Maui under way, and Hawaii expected to be completed in four or five months.

Cattle, sheep, and goats were sent to the isolated peninsula with the idea of making it self-supporting. The new settlers expressed themselves satisfied and contented. Difficulty was found in obtaining transportation facilities.

To March 31, 1866, the expenditures were \$16,012.48; 151 persons had been sent to Molokai; of this number 36 had died, leaving 115.

On December 31, 1865, Dr. Hillebrand expressed his belief that the disease was undoubtedly contagious, but this property did not seem to him to be strongly developed. Dr. Hoffman, in charge of the Kalihi Hospital, said: "The disease is contagious only on close and continued contact."

The report of 1868 shows unexpected trouble with the Settlement, apathy on the part of the public and press, as well as insufficient appropriations and lack of transportation facilities. According to Dr. Hutchinson, "lepers lose their moral sense." Certainly there was much disorder and lack of foresight. Two things he found desirable, a hospital at the Settlement to care for the worst cases, and a nurse, both of which were supplied. He recommends that "as the only justification for taking possession of these people and depriving them of their liberty, is the attempt to exterminate the disease, complete and absolute isolation should be recognized as necessary."

On January 22, 1868, the King approved an Act by which leprosy became ground for divorce.

Dr. Hutchinson again reports in 1870 that the "disease is contagious and inherited, but that as it is decreasing the efforts to check it are presumed to be successful." The difficulties of complete segregation where no dread or fear exists were encountered

and a Bill was presented to the Legislature imposing a penalty on all persons found in the Settlement without a written permit. This became law on July 19, 1870, and under it the Board of Health was "given power to make and promulgate such rules and regulations as may be necessary for the government and control of lepers placed under their charge and these are to have the force and effect of statute law, provided always they are approved by the King, and are published." There is still much trouble occurring at the Settlement. This report deals with insurrection and ration riots, the refusal to work, and the necessity of sending provisions from Honolulu.

The difficulty in transportation resulted in an Act on July 18, 1870, by which all vessels engaged in coastwise trade were required to carry passengers placed on board by the health authorities, on payment of usual and reasonable passage money.

The report of 1872 (still by Dr. Hutchinson) states that the previous flattering accounts of reduction in the number of lepers are all wrong. Opposition has appeared and cases are found secreted in the valleys or in obscure hiding places. The natives are indifferent to the disease. At the Settlement there is improvement. A church has been built by the Hawaiian Evangelical Association and the Catholics are erecting another. Some are cultivating the land, although they all claim rations equally, and there appears no way out of the difficulty, for, if those who raise food are deprived of equal rations, they at once cease to labor. Large rations are granted, and experience shows the disease emphatically contagious.

In March of 1873, Dr. Trousseau, a very capable French physician, expresses the opinion: "That the only method at all likely to be successful is immediate, energetic, and to a certain extent unsympathetic isolation of all who are suffering with the disease," and during the short reign of Lunalilo segregation was more vigorously enforced; 415 cases were admitted as against 91 of the previous year.

February 14, 1873, Kalakaua ascended the throne, and Hon. H. A. Widemann becomes Minister of the Interior as well as President of the Board of Health. He reports "that half-way measures will cause enormous expense and bring no result; that ignorance is great and exposure reckless. Owing to the inade-

quate accommodations; more land has been purchased at the Settlement, water pipe put down, and a store established. That 800 people are fed with large rations, still they clamor for more."

Mr. Widemann withdraws and Hon. W. L. Moehonua becomes President in October, 1874, so that notwithstanding the report, the figures show that the admissions dropped to only 78 for the year 1874, and the total remaining December 31st dropped from 810 to 731.

During the Session of 1874 the Legislature by Act removed the liability of costs from the property of lepers and appropriated a large sum for the care of the Settlement.

The next report, that of 1876, is by Hon. S. G. Wilder, President of the Board of Health. He states that Doctors Powell and Akana, after being given every opportunity to show their skill in curing leprosy and for whom the previous Legislature has awarded \$6,000, utterly failed. Dr. Powell becomes insulting and then leaves the country. The Chinese doctor tries without result.

Mr. Wilder reports the abolition of the Receiving Station and Hospital at Kalihi because isolation was difficult and no cures were obtained. A suitable building was erected adjacent to the police station to care for all received until the physician made final decision. He believes that the disease is under control and that another two years of active segregation, like the past two years, will result in checking the spread of leprosy.

On September 15th, 1876, the law was changed so that the Minister of the Interior was no longer President of the Board of Health, but the King was to appoint this official.

The next report in 1878 is signed by Hon. J. Mott-Smith, this being the fifth year of the reign of Kalakaua. It notes the high price of food, the necessity for a resident physician, and the death of William P. Ragsdale, who has been an efficient superintendent.

This Legislature appoints a "special committee on the state of the Leper Settlement," which makes a visit on May 27th. W. M. Gibson is chairman. The Legislature again increases the appropriation for the Settlement, besides granting \$10,000 for a medical superintendent.

The 1880 report shows Hon. S. G. Wilder again President of the Board of Health. He has secured a resident physician—Dr. Emerson—as well as the introduction of Dr. Goto's medicines

from Japan. He has inaugurated free freight for the lepers and he notes the arrival from China of Father Damien in April of 1879, with a large quantity of medicine known as "Hoang nan pills." This medicine had been heralded as a cure for leprosy.

The report of 1882, signed by William Armstrong, shows that his predecessor, H. A. P. Carter, has started a Receiving Station at Kakaako under Doctor Fitch. Armstrong recommends the expenditure of \$10,000 for a greater water supply at the Settlement. He urges accommodations for visitors and the purchase of all small remnants of land. This report contains a statement by Dr. Fitch, which upbraids the past medical treatment of lepers.

In 1883 there is a sudden increase of admittance. Segregation is enforced. On November 8, Dr. Edward Arning, recommended by Dr. Hillebrand, arrives from Germany to study leprosy.

The report of 1884 is by President W. M. Gibson, who maintains that leprosy is not contagious. Such characterization, he claims, is uncalled for and unwarranted by experienced medical opinion. He asks the Legislature for \$10,000 additional because of increased numbers. He wants Sisters of Charity introduced.

In November, 1885, Dr. Arning is obliged to withdraw, and his report is printed in 1886.

Mr. Gibson in his report of 1886 notes the opening ceremonies of the Kapiolani Home for girls of leprous parents, and he requests more funds for the future. He presents to the Legislature a special report on leprosy in which he now recognizes the disease as contagious, but proposes local segregation. He also presents an appendix of 155 pages, reprinting much that has already appeared. To this a supplement was added of 192 pages, giving extracts of early reports, records, regulations and laws. Gibson also published this same year a summary of reports on leprosy, secured from other countries, containing much valuable data.

The year 1887 saw the upheaval in the Government with a new Constitution. On September 19th, Dr. Emerson is made President, and he signs the next health report to the Legislature on July 7, 1888. In this report Dr. Emerson says: "Leprosy was first clearly made out to exist here about the year 1840 in the person of one Naea. He was a messenger of a chief and died in 1852. His case was reported by Rev. Baldwin, M. D., of Lahaina,

in a communication of May 24, 1864." Dr. Emerson notes the fearful strides leprosy has made, reports 644 suspected cases at large, and begins segregation in earnest, obtaining the largest number of admissions and running the number at Molokai to the highest point yet obtained, 1,033. He points out that every means must be employed to awaken and keep alive public sentiment that shall stand behind the law. Emerson states "that as yet there is no cure but great interest is being aroused and this brings hope."

The Legislature of 1888, as usual by special committee, visits Molokai. Their published report, signed by Chairman W. A. Kinney, recommends among other things, "the complete removal from Kakaako of the Receiving Station and the Kapiolani Home for girls."

The report of 1890 is made by Dr. Kimball, President, and states "that the branch hospital at Kakaako was abolished on July 24, 1888, but that it is temporarily used as a receiving station." Several large buildings were taken down and moved to Molokai. Dr. Lutz, of Brazil, arrived in November of 1887 to make a special study and treatment of leprosy. He is installed at Kalihi, with a number of special patients, assisted by Sister Rose Gertrude. The number of lepers abroad is estimated at 644. There are 1,213 at the end of the year at Molokai, the maximum number reached.

The year 1892 finds Mr. David Dayton in charge of health matters. Dr. Lutz has resigned and correspondence is opened with Dr. Arning, of Hamburg, for the purpose of obtaining another expert.

A select committee of the Legislature visits Molokai and praises the work of Brother Joseph Dutton and Mother Marianne.

Hon. W. O. Smith began his long and remarkable devotion to the interests of the Settlement on February 24, 1893, following the formation of the Provisional Government. The report of 1894 gives evidence of careful segregation, mentions the arrival in 1893 from Japan of Dr. Goto, the expert, and the beginning of the Baldwin Home for boys at the Settlement.

After 1895 part of the quarters used in the cholera quarantine were made into a Receiving Station, where treatment was under the direction of Dr. Wayson.

These Islands were represented by a delegate at the Interna-

tional Leprosy Congress held in Berlin in October, 1897. Dr. Alvarez' report was published in 1898.

Following Annexation the Territory kept up the Settlement in about the same manner, with constant slight improvements, until 1903, when Dr. C. B. Cooper, President of the Board of Health, began to agitate Federal study of leprosy. The local medical association finally sent Dr. Cooper as its representative to the American Medical Association meeting at Atlantic City. There the sole representative of Hawaii urged and secured a vote of approval to the plan for having Congress make a special appropriation for the study of leprosy.

The Governor's report of 1904 shows that he too was in hearty accord with the plan and recommended such an appropriation.

On March 3, 1905, Congress passed an Act to provide for the investigation of leprosy with special reference to the care and treatment of lepers in Hawaii, and provided \$100,000 for a hospital with \$50,000 for its maintenance, conditional on the Territory deeding a site at the Settlement. This was consummated under L. E. Pinkham, who became President of the Board of Health April 13, 1904.

Meanwhile there were important changes in the law. A struggle begun in the session of 1905 culminated in the passage of a new act and the sustaining of the Governor's veto of a bill which had been introduced, providing for a citation to be issued for the examination of suspects and yet permitting the court to cite only those who were actually suffering from leprosy. A new act passed at the last session was hurriedly drawn and proved difficult of execution, and finally in a test case the Supreme Court so ruled that segregation under the act was impracticable.

In the Session of 1909, a new Act, which is still in operation, was passed, making treatment of prime importance and segregation as incident to it. A hospital at Kalihi was provided.

April 20, 1911, an Act was passed allowing the Board of Health to transfer patients from one place to another.

Some idea may be gained of the burden to the taxpayers by an examination of the following table made from the last eight annual reports :

Year.	Amount Spent.	Number of Lepers.	Cost of Each.
1904	\$ 149,325.95	994	\$150.22
1905	132,250.81	858	152.11
1906	96,413.56	828	116.39
1907	115,810.36	798	145.12
1908	165,662.85	791	209.43
1909	141,725.52	723	196.02
1910	162,843.58	614	265.21
1911	204,546.22	592	345.52
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	\$1,168,578.85		

For the purpose of comparison we give similar figures for different earlier periods taken from reports:

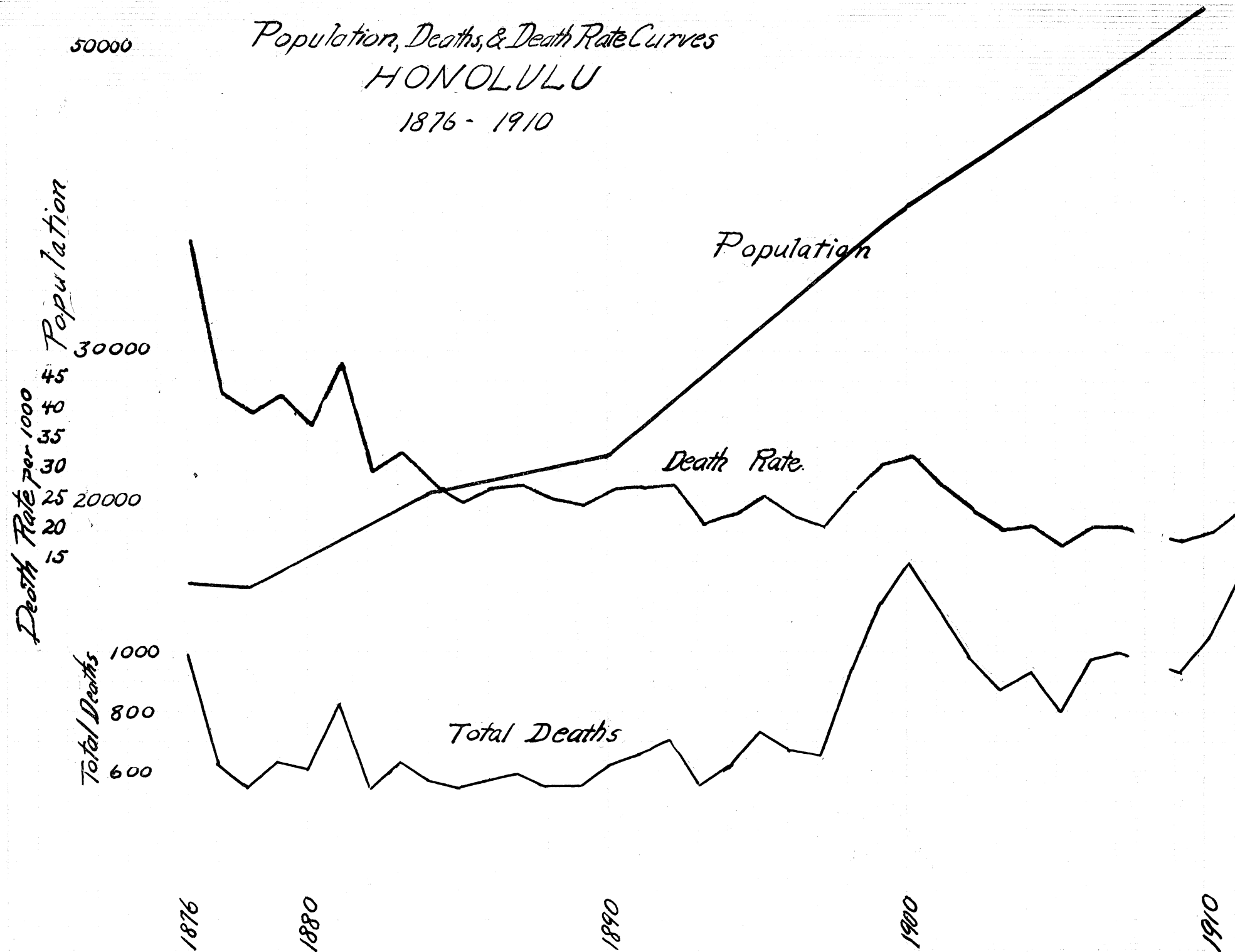
1870	\$ 17,016.87	392	\$ 44.68
1875	29,698.93	754	39.25
1880	43,740.33	589	74.26
1885	54,131.00	663	81.65
1890	169,671.20	1213	139.90
1895	116,447.46	1087	107.12
1900	118,880.03	983	120.93

As near as we can ascertain the total amount of public money spent on leprosy must be about \$3,887,724.90.

We believe that if the present plan of segregation fails to effect the desired end, it would be well worth while to consider carefully whether local segregation would not give better results than the present system. This would undoubtedly be more expensive than the plan in vogue at the present time, but it is possible that if segregation could be effected in a place where patients would not be so far removed from relatives and friends as at Molokai, the result might be a disposition on the part of lepers to present themselves in the earlier stages of the disease and a willingness on the part of relatives to permit members of families to be isolated.

SECTION IV.—MORTALITY RECORDS.

From 1851 to 1863 the mortality records were kept by the Board of Education. The records for 1864-1865 were not completed.



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From 1866 to 1876 the Board of Health kept the records of births and deaths throughout the Islands, and from these figures the mortality tables have been compiled. They show a total number of 69,605 deaths, not including the years 1864 and 1865.

The death rate for these early years varies from 109.71 per 1,000 in 1853 due to smallpox; 64.8 in 1870 due to scarlet fever; to a minimum of 21.2 in 1854.

Death Rate in Honolulu.

On April 7, 1876, the Board of Health began a record of the deaths in Honolulu. The report of 1878, for the first time, shows an attempt to give the cause of death.

During the first 10 years, 1876 to 1886, there were 6,516 deaths in Honolulu. With the exception of the first year, in which perhaps there was an error, the highest death rate was that for the year 1881 due to smallpox, when there were 46.3 deaths per 1,000. The lowest death rate was 24.4 in 1885, while the average rate for the first 10 years was 40 out of every 1000.

During the next 10 years, 1886-1896, the total deaths in Honolulu were 6,153, or an average of 25.3 per 1,000; the highest death rate being 27.7 per 1,000 in 1892 and the lowest being 21 per 1,000 in 1893.

The period from 1896 to 1900, covering 4 years, shows a total of 3,411 deaths, with an average rate of 25.1 per 1,000; the highest being that of 1899, when the rate reached 31.1, due to plague.

Since annexation, taking the 11 years from 1900 to 1911, there have been reported 10,377 deaths, with an average rate of 22.0 per 1,000; the highest rate being 32.8 for the year 1900, and the lowest being 17.3 for 1905.

This makes a total of 26,144 recorded deaths in Honolulu from 1876 to 1911.

Death Rate in All Islands.

Year.	Population.	Deaths.	Rate.	Cause.
1851		5,792		
1852		2,822		
1853	73,138—Census	8,026	109.7	smallpox
1854	72,661	1,439	21.2	
1855	72,184	1,685	23.3	

1856	71,707	1,479	22.0	
1857	71,230	2,017	28.3	
1858	70,753	2,104	29.7	
1859	70,275	2,291	32.6	
1860	69,800—Census	2,343	32.2	
1861	68,660	2,249	32.8	
1862	67,520	2,426	35.9	
1863	66,520	2,657	30.0	
1864	65,240			
1865	64,100			
1866	62,959—Census	2,941	46.8	
1867	61,900	2,610	42.2	
1868	60,900	3,351	55.0	
1869	59,900	3,528	58.9	
1870	58,900	3,819	64.8	scarlet fever
1871	57,900	3,502	60.4	
1872	56,897—Census	3,083	54.2	
1873	57,077	3,036	53.1	
1874	57,257	3,043	53.1	
1875	57,437	3,262	56.8	

Death Rate in Honolulu.

Year.	Population.	Deaths.	Rate.	Cause.
1872	14,852—Census			
1876	14,384	981	error? 67.7	
1877	14,300	624	42.6	
1878	14,114—Census	555	39.5	
1879	15,174	638	42.0	
1880	16,234	607	37.4	Measles and typhoid
1881	17,294	818	47.3	Smallpox
1882	18,354	542	29.4	
1883	18,414	633	32.8	
1884	20,487—Census	567	27.6	
1885	20,890	551	24.4	
10 years' average		6,515	40.0	
1886	21,293	573	26.8	
1887	21,693	593	27.3	

1888	22,099	555	25.1	Measles and dysentery
1889	22,502	548	24.3	
1890	22,907—Census	627	26.9	Diphtheria
1891	24,076	652	27.0	
1892	25,245	701	27.7	La grippe
1893	26,414	555	21.0	
1894	27,583	617	22.3	
1895 cal. yr.	27,752	731	25.4	Cholera
10 years' average6,153		25.38	
1896	29,920	673	22.4	
1897	32,266	659	20.4	
1898	34,612	926	26.7	
1899	36,985	1,153	31.1	Plague
4 years' average3,411		25.1	

Honolulu's Death Rate Since Annexation.

Year.	Population.	Deaths.	Rate.	Cause.
1900	39,306—Census	1,290	32.8	Plague
1901	40,594	1,125	27.7	
1902	41,881	971	23.2	
1903	43,169	864	20.0	
1904	44,456	925	20.8	
1905	45,744	792	17.3	
1906	47,319	964	20.5	
1907	48,319	964	20.5	
1908	49,607—six months	503		
1909	50,895	925	18.1	
1910	52,182—Census	1,030	19.7	

Average 10,377 22.05

Total deaths in Honolulu from 1876 to 1911, 26,144.

SECTION V.—PRESENT BOARD.

The Board of Health at present is composed of seven members: Four laymen, two physicians, and the Attorney General, *ex-officio*. They are appointed by the Governor with the approval of the Senate. All serve without pay except the President.

The Board is required (1) to keep a regular report of its pro-

ceedings; (2) to take general charge, oversight, and care of the health and lives of the people of this Territory, and (3) to report annually through its President to the Governor, showing all expenditures in detail and such other information as it deems of public interest.

The powers granted the Board are general. It has power (1) to appoint agents throughout the Territory; (2) to disburse all money appropriated by the Legislature for the preservation of public health; (3) to establish and regulate quarantine in the Territory, or in any of its harbors; (4) to prevent any county from issuing license for any of a number of specific things (*see note) except upon examination and approval. Also to cancel licenses; (5) to make with the approval of the Governor regulations respecting nuisances and other specific matters (** see note) within the Territory, or in any vessel, as it deems necessary for the public health and safety; also respecting articles capable of containing infection or contagion, or creating sickness, when such are brought into or conveyed from one district within the Territory, or into or from any vessel.

It is the duty of all Territorial and County officers and employees to report nuisances and to aid in the enforcement of the health laws and rules and regulations of the Board of Health.

Physicians are required by the law to report all contagious and infectious diseases. The power of the several counties respecting health matters is concurrent with that of the Territorial Board of Health.

* NOTE.—Those things specified are: Erection, maintenance, use, or operation of any (1) building, (2) bakery, (3) laundry, (4) poi shop, (5) abattoir, (6) stable, (7) fish, meat or vegetable store or market, (8) hotels, tenements or lodging houses, (9) or any place or building where noisome and noxious trades or manufactures are carried on, or intended to be carried on.

** NOTE.—The specific nuisances subject to regulation are: (1) Foul or noxious odors, gases or vapors, (2) water in which mosquito larvae breed, (3) sources of filth, (4) causes of sickness or disease. The power also extends to (5) adulteration and false branding of foods, (6) drainage, (7) location, air space, ventilation and sanitation of buildings, courts, areas, alleys, (8) privy vaults and cesspools, (9) fish and fishing, (10) interment of dead bodies, (11) laundries, stables, bakeries, poi shops, abattoirs, fish, meat and vegetable stores or markets, (12) hotels, tenements and lodging houses, and (13) any place or building where noisome or noxious trades or manufactures are carried on or likely to be carried on, (14) milk, (15) poisonous drugs, (16) pig and duck ranches.

The work of the Board of Health is based upon the principle that there are many preventable conditions that contribute to the lack of health.

Public health work is largely a matter of sanitary science, requiring special study, and certain states have accordingly inaugurated special schools for those who desire to take up such work. A number of universities now provide courses in sanitation and hygiene in order to meet the demand for trained men to act as health officers for towns and cities or to take charge of communities where epidemics exist.

Methods change as time progresses, and a study of the development of our present Board of Health shows that its present methods are what Honolulu is ready to receive. Within a few years, when people become dissatisfied with preventable death, poverty from illness, and the cost of neglect, more will be required not only from the Board of Health but from the Courts and from the Legislature. Honolulu will then take the same attitude as certain other communities where the Board of Health is admitted to be the best authority on public health questions—the experts to whom all such matters are confided.

SECTION VI.—WORK.

Ordinarily the public pays little attention to health work. Few taxpayers know the cost of health measures. Citizens have no idea of the volume of routine work that is necessary to carry on the many branches of activities in which the Board of Health is engaged.

These activities are: Leprosy, with 592 people at Molokai to be cared for and fed, besides attending to their many wishes and furnishing them with medical treatment; and the Kalihi Hospital, where examinations are made and fifty or more cases under treatment, requiring attention to every detail; statistics and mortality records to be kept, which are in health matters what bookkeeping is to business, or surveying to land matters. They measure and describe the ever varying conditions of health. The detailed vital statistics are absolutely essential and those of each of the five counties are kept in addition to those of Honolulu; reports of all dangerous diseases to be received and acted upon; free dispensary, laboratory and bacteriological work, and the protection of certain

food standards ; anti-tuberculosis bureau ; medical superintendence of the insane ; continuous rat and mosquito campaigns ; physicians, maintained in twenty-three districts throughout the Territory ; inspection and control, through licenses of buildings, bakeries, tenements, lodging houses, poi shops, the keeping of pigs, etc., etc. ; inspection and prompting of individuals in the ordinary conditions about their kitchens, privies, stables, chicken yards, duck ponds, plumbing and drainage ; maintaining similar inspection in various other districts ; making appointments ; directing and consulting with all those employed ; keeping accounts ; watching appropriations ; securing bids and awarding contracts ; condemning nuisances ; work on new and necessary legislation ; recording proceedings and annually preparing a report.

Besides the foregoing work, there are special calls due to various outbreaks of disease from Kauai to Hawaii, and periodically some severe epidemic, taxing all reserve forces.

This is the work of those, who patiently, conscientiously, and earnestly aim to better all health conditions.

SECTION VII.—NEED OF PUBLICITY.

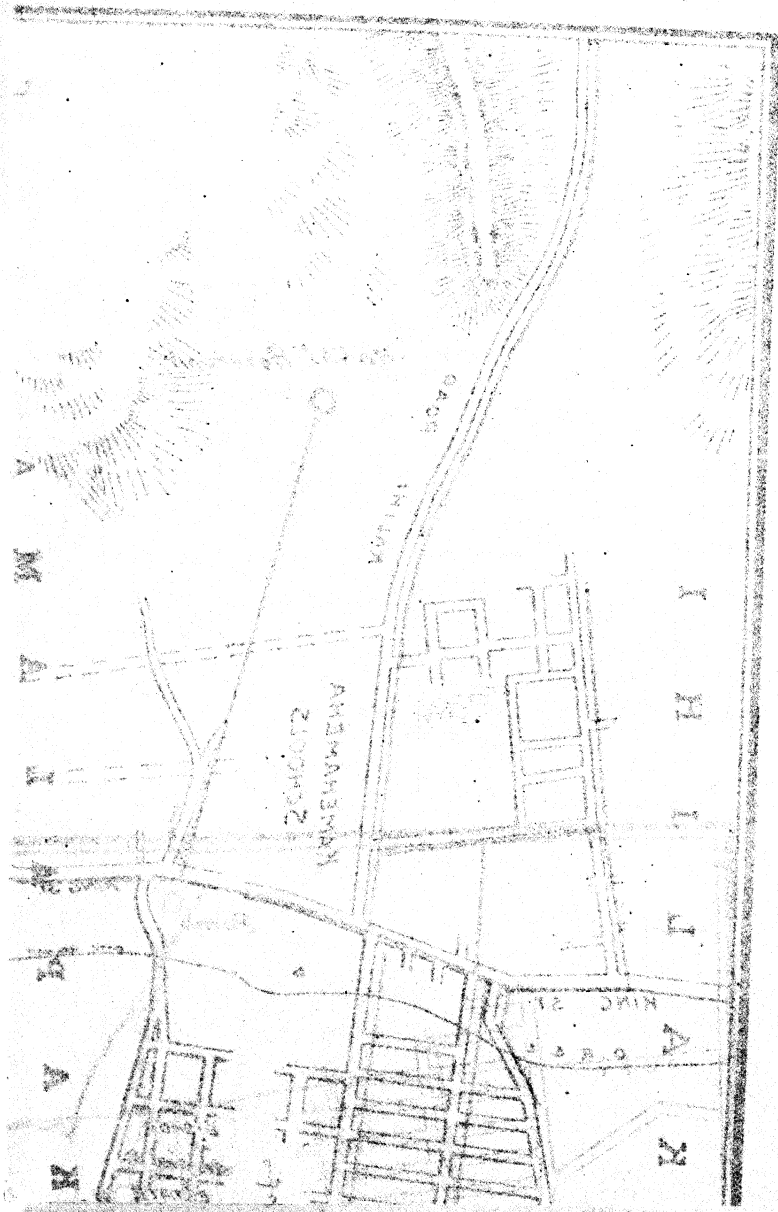
All the foregoing work to be done by the health authorities is aided by the press, but sometimes other news crowds out most important information.

Ignorance is admitted everywhere as the cause of waste, and education is the keynote of successful health work. Therefore much of the public money now expended would be more effective if a small percent were spent in publicity. The people are entitled to know what their officials are doing. The school teacher should be helped in teaching our future citizens sanitation and hygiene.

It is a serious defect for public representatives to do their work in silence. The Legislature should so provide that the public shall receive constant and regular information of the work being done by the health authorities properly prepared.

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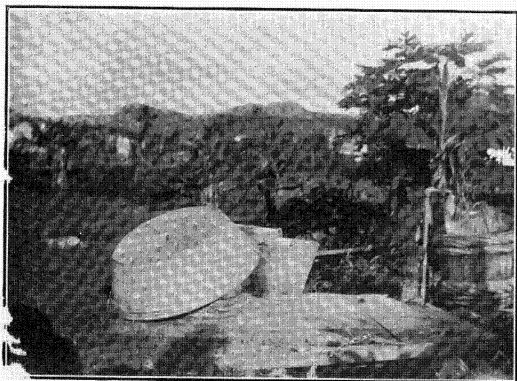
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CHAPTER 7.—WATER SUPPLY.

SECTION I.—BRIEF HISTORY.

Marston Campbell has had compiled a most interesting history of Honolulu's water works. From this and the general report we learn that, for some time after the discovery of Honolulu Harbor by Captain Brown in 1794, the only water used by the inhabitants



3H PLACE DIRECTLY OVER A DITCH, WATER FROM WHICH PASSES UNDER JAPANESE HOUSE WHERE VEGETABLES ARE WASHED

was that of Nuuanu Stream, into which vessels sent their boats for the purpose of filling their casks.

About 1820 surface wells were dug into the coral, but some of the people sent for their drinking water to the springs in the foothills.

After the reorganization of the Government in 1840, and the increase of the whaling industry, came a demand for a more convenient supply to the ships. In 1848 the Minister of the Interior put a tank in the basement of the pilot's office at the foot of Nuuanu Street, from which the ships' boats could readily fill their casks.

This, the first Government water works, was supplied through a lead pipe from an old taro patch on Emma Street near the Central Grammar School.

The system was even then a make-shift, for both pipe and supply were objected to by a number of the community. Although at first confined solely to the use of ships, the enterprise was extremely profitable, and in 1850 a supply of four-inch pipe was ordered for its extension and improvement as well as to provide fire protection.

During 1851 a small reservoir was completed on the Waikiki side of Nuuanu Street about opposite the end of Bates Street. During 1852 four or five hydrants were placed in the village and there was a constantly increasing demand for private and individual use, which caused the Minister of Interior in 1855 to submit to the Legislature the reports and plans of the expert, William Webster, for an improved water system. The authorities estimated then, that a sufficient daily supply would consist of an average of 60 gallons per capita for 6,000 people. This would require the 4-inch main to be replaced by a 6-inch iron pipe. Notwithstanding that the population in 1854 was 11,455, yet only a portion were thought to be able to indulge in the luxury of a direct water system. In 1859 the Government borrowed \$20,000 at 12 per cent interest from James Robinson & Company and purchased iron pipe.

In 1860 came an act to condemn the necessary land for the improvements previously suggested, but not until 1862 were they finally executed. In that year a second and larger reservoir was built. It was situated just above the old one near Nuuanu Stream between Bates and Judd Streets and was used until 1895. This reservoir was supplied from the same stream as the former smaller one had been, but being inadequate, a pipe was laid from Kapena Falls and additional water was taken out of Nuuanu Stream. The fluctuation in the volume of water between seasons was very great and the use of larger amounts of Nuuanu water brought the Government in conflict with the private owners interested in Paki's auwai and other irrigating ditches. Thus after fifteen years the system was still a make-shift but profitable.

From 1862 to 1866 and thereafter there was a period of stagnation. Whaling had declined and no complete substitute had

been found. The population in the meanwhile had only increased to 13,251.

In 1870 came the purchase of Paki's auwai and other water rights.

In 1876 the Reciprocity Treaty with America overcame the period of stagnation.

The map of Honolulu in 1877 shows that the system had about seven miles of pipe line, but no material change had taken place save better protection for the source of supply and a gradual absorption of the individual water rights.

In 1879 came the first successful artesian well. In 1880 came the Makiki Reservoir with its capacity of 725,000 gallons, and 10 miles of pipe up Nuuanu to the new reservoir on Queen Emma's property. In this year an act was passed to protect certain lands used as water sources from trespass of any domestic animals. The lands were those lying at the source of all streams above (or mauka) of Beretania Street between the western slope of Kalihi and the eastern slope of Palolo.

In 1882 a filter was constructed just above the reservoir in Nuuanu on J. H. Wood's property, Pawaa artesian well was sunk, and those at the Palace and Mililani begun.

In 1884 five artesian wells, either bored or purchased, were owned by the Government and a complete sectional map of the water system shows that its supply for a population of 20,487 came from the streams in Nuuanu and Makiki Valleys and the artesian wells. Pipe lines and fire hydrants were located over a large area extending from the present fire station on King Street in Palama through the town across the plains on King, Beretania and Wilder Avenue to Punahou Street and out Waikiki as far as Kapiolani Park.

In 1886 came the great Chinatown fire and Major Bender's plans for improving the water system. Honolulu's population was then about 21,293, and there was about 25 miles of pipe line service. This resulted by 1888 in new and heavier mains up Nuuanu Valley with two new reservoirs, as well as the installation of the electric plant, by which water power was first used to furnish light.

In 1889 a severe drought caused a search for more water and the beginning of careful measurement of the sources as well as

restricted regulations in the use of water. A fire engine for the first time pumped water from Thomas Square artesian well.

In 1890 the population was 22,907 and the pipe lines had increased to 35 miles.

Another severe drought in 1891 renewed the demand for more and better service.

From 1891 to 1894 much money was spent in renewing the pipe lines, which had become entirely inadequate. In the summer of 1894 water was more scarce than usual and a contract was let for two artesian wells and a pumping plant at Beretania and Alapai Streets. This plant was completed in 1895, adding more than 2,500,000 gallons per day of the first water which could be relied upon.

Then came the first epidemic of cholera, and artesian water was used, when possible, throughout the city. By the end of 1897 extensive repairs and alterations of the pipe lines had taken place, and the Punchbowl reservoir, capacity 500,000 gallons, was completed.

By 1899 the wells for Kalihi Pumping Station were sunk and work on the installation begun. Diamond Head reservoir was built with a capacity of 887,000 gallons.

Annexation to the United States took place in August, 1898. Honolulu then had a population of 39,306.

On June 14, 1900, the Organic Act went into effect.

From 1901 to 1904 was a period of extension of the fire system and pipe lines. In the latter year the town had 333 hydrants. The Kaimuki pumping plant and water system, built by private enterprise, was purchased for \$75,000 and the contract let for the big Nuuanu Dam. It was then estimated that the people of Honolulu consumed daily 7,850,000 gallons, or approximately 200 gallons per capita.

By 1906 Kalihi reservoir was completed and the Makiki Dam providing another reservoir for 800,000 gallons was under way. During that year, notwithstanding these improvements, it was necessary to restrict the use of water and a system of careful water inspection was under trial.

In 1909 the Legislature for the first time put the water works on a self-supporting system. Revenues, after paying the expenses of operation and the fixed charges incurred for interest on the

bonded debt used in the construction of the various works, can now be applied towards the permanent improvement of the water and sewer systems.

In 1910 two 12-inch artesian wells were sunk and a high-lift pump installed at the Beretania Street station, and Nuuanu Reservoir Number 4 was completed with a capacity of 639,000,000 gallons at a cost of \$298,563.89. Kaimuki Reservoir with an additional capacity of 750,000 gallons was under way and the pipe line system partially extended.

SECTION II.—ARTESIAN WATER.

In 1859 R. C. Wyllie while in charge of the Bureau of Public Works, states the following: "I am not sure that a large portion of Honolulu might not be supplied with good water by artesian wells. That there is a subterranean current of fresh water quite close to town on the plains leading to Thomas Square, I know to be a fact, because in 1854 I obtained an experienced leadman who carefully sounded it When I find leisure I contemplate boring at my own expense. There is a boring apparatus in tolerable order left here by Commodore Wilkes. I have written to obtain estimates of the price and cost of working a modern apparatus for boring to the greatest depths."

It is interesting to learn from the research work undertaken by the Superintendent of Public Works, Mr. Marston Campbell, and from other sources that the first bored well to flow outside of Honolulu was at Honouliuli, and the first in Honolulu was that of Dr. A. Marques in 1880 in the Punahou District. The artesian level in the Honolulu basin was found to be 42 feet above sea level.

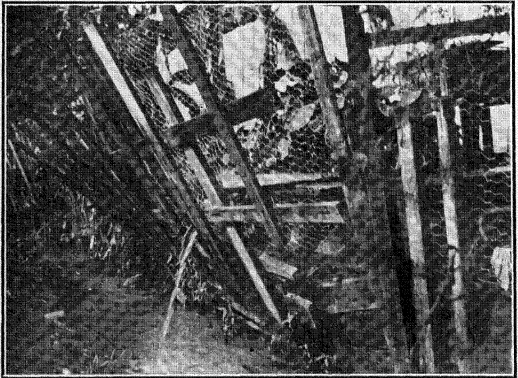
The Legislature of 1880 appropriated \$20,000 for artesian wells, and in 1884 an Act was passed to prevent the waste of artesian water on the Island of Oahu. It required all flowing wells to be capped and prohibited all waste except for irrigation purposes.

By 1889, 47 wells had been bored in Honolulu. The artesian level had fallen somewhat but regained the 42-foot mark that year.

By 1910 there were 117 wells drawing from the supply and the artesian level in the city is now 30 feet. If this can be depended

upon, we have only 50 years' supply. We are therefore consuming our reserve and eating into our principal at about the rate of 7 inches each year.

A portion of the City of Denver, supplied by wells, suddenly one morning found every well dry. Investigation showed that had the source been regulated to its yearly increase, the use could



SINK WATER DRAINING INTO DITCHES BACK OF WASH-HOUSES IN PALAMA
Eight such drains as the two preceding in a distance of 500 feet

have been indefinite, but exhausted it would take 60 years for its return.

Deep wells, if properly cased, furnish the purest and safest water.

SECTION III.—SIZE OF SYSTEM.

Our present supply of water is taken largely from artesian sources. The estimated consumption for the year ending June 30, 1911, was as follows:

Artesian	Gallons.
Kaimuki	884,606,100

Beretania	1,143,301,000
Kalihi	1,272,517,200
<hr/>	
Total Artesian	3,300,424,300
Makiki	125,925,000
Nuuanu Sources	2,007,361,000
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	5,433,710,300

This gives an average daily consumption of 14,887,000 gallons. On the basis of a population of 52,000, this would give a daily per capita consumption of 286 gallons.

There are 78.61 miles of pipe in the system. As there are 4,992 connections, the average length of pipe required for each connection is 83½ feet.

The system now has four pumping plants, viz:

Location	Type	Rated Daily	
		Lift Feet	Capacity R.P.M. Gallons
Beretania (high)	Horizontal cross-compound Blake end	300	50 3,000,000
Beretania (low)	Horizontal cross-compound outside packed plunger	160	21 2,500,000
Kalihi	Vertical triple expansion	180	36 5,000,000
Kaimuki	Horizontal cross-compound outside packed plunger	300	50 3,000,000
Makiki (seldom used)	Gas triplex	125	600,000
<hr/>			
Total			14,100,000

In order to secure uniform static head on the system, the pumps deliver the water to covered reservoirs, the capacity of which are as follows:

Punchbowl	1,500,000 gallons
Kalihi	3,200,000 "

Diamond Head	887,000	“
Kaimuki	750,000	“
<hr/>		
Total	6,337,000	“

The surface water used is all taken from Nuuanu Valley. The catchment of the big upper reservoir is some 1,250 acres. There are in the valley four surface reservoirs of about the following capacity:

No. 1 Electric	21,000,000	gallons
No. 2 Luakaha	7,000,000	“
No. 3 Luakaha	10,000,000	“
No. 4 Dam	639,000,000	“
<hr/>		
Total	677,000,000	“

The source of all the surface water that we use in Honolulu is from the rain that falls on that portion of the Island of Oahu in which are found the watersheds of Nuuanu, Palolo, Makiki, and Pauoa Valleys. The artesian wells in Honolulu basin augment the surface supply. The definite limits of the watershed for the artesian basin are not so clearly defined.

SECTION IV.—LACK OF PROTECTION.

Mr. George C. Whipple in his admirable work on “Typhoid Fever” says that “it is epidemics which arouse careless communities to the protection of their water, cause laws to be passed for the prevention of infection, and awaken citizens to a sense of their responsibilities in a way constant danger would never do. They have enlightened the public as to the principles of sanitary science and compelled officials to apply those principles for the common good.”

Honolulu will some day see the necessity of protecting the catchment area used in Nuuanu Valley. A study of epidemics elsewhere shows that storage water can be infected by pure mountain brooks which flow for several miles before they empty into the reservoirs. Nor does the size or quantity of water obviate the danger.

On last Labor Day in a trip to the Pali, twenty-six people were

counted who had evidently been wandering in and over the catchment area of our water supply.

Remedy. We should demand, first, that the Nuuanu Road, passing through the catchment area of our present supply, be fenced on each side and that these fences be continued so as to keep out of the drainage area stragglers, and that the catchment areas of the remaining reservoirs also be fenced, or the reservoirs condemned and the use of water from them prohibited.

Second, the construction of concrete gutters along both sides of the Nuuanu Road so as to carry all drainage from the road area to a point below the catchment area is necessary.

Third, the watersheds should be constantly patrolled so as to rigidly enforce the requirements of Section 1.

SECTION V.—WASTE.

While waste is not detrimental to our health conditions, yet excessive extravagance restricts the funds available for other improvements.

A tropical city needs an abundance of water, but the quantity we now use is beyond reason and serves to show that our taxpayers are content with an unnecessary expenditure of their funds. This enormous waste is either in the distributing system, in the plumbing fixtures, or in the irrigation of lawns, vegetables or perhaps taro patches and rice fields.

Control of waste by inspection has been tried, but it is impossible with 78 miles to cover and, say, 25,000 taps or fixtures to look after. The only practical way to check waste and accurately measure its extent, or to ascertain its source, is by meters. Waste is not always due to the consumer. Other cities upon adoption of the meter system have found the waste in the system itself sufficient to pay more than the interest on the capital necessary to relay and repair. The saving and economy is surprising.

One illustration is the City of Kalamazoo, Michigan, where the sewer system was overtaxed and about to be replaced with larger mains, when the suggestion of meters was adopted, with the result that at the end of ten years, with double the population, the city was pumping 77,000,000 gallons less than the year before meters were installed, while the old sewers had proven ample and were still in use.

Our water consumption far exceeds that of most other known communities, and the waste is not only in the cost of the water but it is overtaking our trunk lines of sewers and increasing the cost of pumping sewage.

Remedy. Water from deep artesian sources through bored wells tightly cased to bottom is so much safer than any surface water, that the Nuuanu supply should be used to furnish power with which to pump the better water and to give fire protection. Thus we should demand, first, that the supply of artesian and pure spring water be developed, and, second, the expense of delivering the supply be reduced.

A tropical city, without the beneficent effects of frost and spring floods, needs an abundant quantity of water, therefore the comparison of water charges in mainland cities offers no satisfactory criterion. We should insist upon cheap water, but demand that our present waste be checked or paid for.

CHAPTER 8.—SEWAGE DISPOSAL.

SECTION I.—EARLY REFERENCE.

The first official mention for the need of a sewerage system was by S. G. Wilder, President of the Board of Health, in his report of 1880.* After urging the necessity for action, he gives the report of Robert Stirling, an engineer, who recommended the dry earth system.

The Legislature responded with an Act authorizing the Privy Council to adopt a scheme for sewage disposal and gave the Minister of the Interior power to cause surveys and maps to be made to open trenches in any public or private street for the purpose, the cost to be borne by the Public Treasury, and the Privy Council to determine what portion, if any, of the cost should be borne by the property owners.

In 1884, W. M. Gibson, President of the Board, stated "that the weight of public opinion is against the pipe system," and he recommended night service; however, in 1886 he referred to a

(* Page 33, see Act on Sewerage.)

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special report made by Major Bender to C. T. Gulick, Minister of the Interior, which stated that "the necessity for some system has long been recognized. If any assurance could be given to show that the ground would not become saturated in consequence of clogging, it might not be unwise to continue the present absorption system." He stated that "sewage cannot be safely used in agriculture, that a system of earth closets here would be impossible, and that the final disposal must be the sea," and recommended, owing to excessive rainfall, sewerage pipes without surface drainage in them.

In 1886, W. E. Rowell, Superintendent of Public Works, in his report to the Minister of the Interior, called attention to the failure of Major Bender's plans to provide any scheme for the disposition of the sewage, and that the maps are not in conformity with the plans as reported, and it would seem desirable that a properly prepared scheme be elaborated with plans, specifications, estimates, reservoir, pumping plant and outfall," and he requested an appropriation of \$1,200.00 for this object.

In 1890, Dr. J. H. Kimball, as President of the Board, reported at length on the necessity for a sewerage system and aptly denoted sewage "as matter in the wrong place." The subject had been agitated in other quarters, for L. A. Thurston, Minister of the Interior, stated in his report as follows: "The sewerage of Honolulu has often been discussed and an appropriation made by the last Legislature for plans and estimates, resulted in the employment of G. F. Allardt, whose report was presented separately to the Legislature. He recommended a pipe system for the sewerage question. In other countries the expense of the mains and plant is borne by the city, while the cost of the branches and connections is paid for pro rata by abutting property owners. If this is done the cost will not be great, but it will need an Act to secure the contribution of property owners." Allardt's report was a pamphlet of 23 pages, in which he described Honolulu as "a city with 25,000 people, with extensive flats, and a mean rise and fall of tide of 1.7 feet, with a harbor of sluggish water." He stated that "no advantage of soil or climate will counteract or render harmless the evil effects of an accumulation of sewage, that experience shows to have a marked effect in assisting the ravages of disease and death." He recommended water carriage

by small sewers without surface drainage, and selected an outfall location about where it is at present. He proposed it should be pumped out 2,000 feet from the shore line, and recommended the using of water-power from a reservoir to be located on the slopes of Punchbowl. He estimated the ultimate cost of the system he proposed at \$263,541, but believed the immediate necessities required attention of only the area from the junction of Nuuanu and Pauoa down through the town. He called attention to the fact that in California, the cost of sewers, except the mains, intercepting sewers and outfall "is assessed to the abutting property owners and the street crossings adjusted to the adjacent quarter blocks. Thus public money is required only for the frontage of public property. The cost of the mains, etc., is easily raised by special taxes on either the whole city or the drained area."

In 1892, T. H. Davies & Co. published a description of the Shone System, which used compressed air and patent ejectors—an excellent system for low areas.

In 1895 came the first epidemic of cholera, with its 87 cases and 64 deaths in two months. During this year a pamphlet appeared by "Pro Bono Publico" on "The Sewerage Question in Honolulu." The author stated that "after our cholera experience, the sewage must not go into the sea, for in this case the fish become polluted and black mudbanks will form along the shore." He drew attention to the effects of the sewage of London emptied into the estuary of the Thames and being washed up and down with the tides, and stated that "to empty the sewage of Honolulu in this way is to bequeath to posterity a hotbed of disease." He pointed out the imperative need of the speedy removal of sewage and suggested that "as dry earth absorbs and prevents decomposition" therefore he recommended "dry pits filled daily with dry dirt—nature's way."

In 1896, W. O. Smith, President of the Board, stated "that there is as yet no sewerage system, but that F. S. Dodge has been sent to America and Europe to study the subject and report." This report was printed in the same year and in it Mr. Dodge stated that "the sewage of Honolulu is no longer a question of need but rather which system to adopt." He described many of the systems in the cities visited by him and his conferences with expert sanitary engineers. He recommended a separate system

discharging into the sea and stated that "it is the part of wisdom to secure the best experts to draw plans and give estimates of cost." His suggestion was adopted, and Rudolph Hering, of New York, a former associate of Col. Waring, was employed.

In 1897, Mr. Hering's plans were submitted with the printed report. He estimated for a city of 50,000 people, with a density of 80 per acre in the down town business portion, and 30 per acre in the area extending to School Street and Kalakaua Avenue, with about two-thirds of the remaining area at 30 per acre. He believed that there was no question as to the advisability of a separate system and quoted from A. B. Lyons some interesting figures as to excessive rainfall.

Hering pointed out that our ships discharged into our harbor all the sewage it could stand and contended that the best outfall was east of the harbor at a depth of 100 feet. There the sewage would never be noticed and the prevailing currents would take it away from the Island, if as he pointed out *it was screened at the pumping station*. He stated that "the amount of sewage is proportionate with the water supply" and he figured 60 gallons per head per day and planned to have the pipes run half full and he insisted that the work of construction must be carefully done, as "it is imperative that the system be *absolutely water-tight*." His plans did not cover the swamp lands or certain low areas, which he said "will need a separate system."

In 1898, W. O. Smith, President of the Board, reported that "the great need of sewerage is being met and that the plans have already arrived from New York and an appropriation has been secured from the loan fund of \$257,000."

In 1899, President Smith reported further that "the construction of sewers was commenced in April and is progressing rapidly."

SECTION II.—CONSTRUCTION.

The following table gives the lineal feet of sewers constructed each year, including that done by private enterprise:

Year.	No. of Feet Built.
1899	61,023.5
1900	75,627.9
1901	4,582.8

1902	12,735.2
1903	2,316.5
1904	46,796.8
1905
1906	6,874.9
1907	7,911.0
1908	4,589.0
1909	2,501.0
1910	7,192.6
Total	232,151.2

SECTION III.—PRESENT SYSTEM (MAP).

On September 9, 1911, our city sewage was collected from 2600 connections into 58 miles of pipe line, extending from Bingham Street out on the plains along the foothills, across Nuuanu Valley at Judd Street, along Asylum Road to King Street, and back along King Street including the waterfront and business portion. (See map.)

In this area there are, however, a few places too low for the gravity service, such as Waikahalulu, part of Palama below Kukui Street and at the junction of King and Liliha Streets, but all can be connected to the new extension now being constructed, known as the Waipilopilo extension, and should be forced to do so.

The cost of the system up to June 30, 1911, has been *\$512,796.51, which does not include the amount contributed by firms or individuals in extending the system.

The cost of operation for the year ending June 30, 1910, was **\$21,146.00.

The pumps are doing a service of from two to three times their normal duty; in other words, the system is handling from 6,000,000 to 9,000,000 gallons of sewage a day. This is from about two-thirds of our population, as the service does not extend to Wai-kiki, Kaimuki, Palolo, Manoa, the slopes of Punchbowl, Liliha extension, Alewa, upper Nuuanu, a part of Kapalama, and Kalihi

NOTE.—* Auditor's letter of December 14, 1911.

NOTE.—** Public Works Report for 1911, page 173.

flats, so that instead of 60 gallons daily for 50,000 people, as figured by Rudolph Hering, the amount is nearer 200 gallons for each individual, and if meters were put in it would easily be cut in half.

The outfall leak is caused by the washing away in some storm of two sections of the pipe shortly after construction.

This occurred in about 18 feet of water and the sections can be seen lying near by on the bottom. Thus the whole city's sewage rises just where the rollers break and it is easily located by its color and the swarms of jumping fish that surround the spot. More need not be said.

As a result of our survey we find there are over 2,263 cesspools still being used, the contents of which are seeping into and contaminating the surface water and soil, and there are in addition over 2,403 privy vaults, or a total of 4,666 sources of danger, the contents of which should be disposed of in some better way, if we are to keep the ground under us free from danger.

The way these are grouped proves interesting. Take the flat, usually wet, area beginning at the sea, up Sheridan Street to King, out King to beyond Alexander, up to Beretania and out to the Moiliili Church, thence across the rice fields to the Seaside Hotel, and we find 304 cesspools with 259 privy vaults.

In addition to the area above, from Piikoi Street along the foothills, across Oahu College pastures, intersecting Metcalf, thence down to King and back to Piikoi, an area including our best residences, we find 151 cesspools, also 65 privy vaults.

Districts not yet completely sewered can be excused, but right in the city's heart, that is from the sea up to Punchbowl Street to Vineyard, thence to Liliha down and along King Street to the sea at the River Street bridge, there are still in use 17 cesspools, and 22 privy vaults; of these 13 cesspools and 14 privy vaults are found to be in the low level rectangle bounded by Fort, Liliha, Vineyard and Beretania Streets.

Down in Kakaako, below Queen Street, there are 51 cesspools and 38 privy vaults.

SECTION IV.—DEFECTS AND REMEDIES.

Rudolph Hering in his report stated that the "volume of sewage depended upon the consumption of water" and warned us that

it was essential to have our system built water-tight, which it is thought was done.

It appears, however, with only about two-thirds of our people served, the system is over-taxed. In rainy weather, it is reported that the pumps show a daily discharge as high as 9,000,000 gallons a day in place of 3,000,000, or a slight error in computation of 6,000,000 gallons by the designer.

The King Street main is on occasion so overloaded that to prevent its overflowing fixtures in private houses there has been an opening made so that when over-taxed the surplus sewage empties into Nuuanu Stream at River Street. The King Street trunk was a mistake and exhibited an utter disregard for the contours of the city.

In the expenditure of the present Loan Fund Appropriation, it has been found necessary to build another large trunk sewer along the waterfront from King and River to Queen and Nuuanu; this, however, will take care of all that district north of King Street between Liliha Street and Houghtailing Road, and between Liliha, River and Judd Streets and all the districts south of King Street between the Kamehameha Girls School and the Prison road, including the Canneries and Iwilei.

If the present waste of water can be stopped and property owners are forced to comply with the law regarding sewer connections, the sewage flow will probably not be over 50 per cent of that shown at present. If additional and sufficient surface drainage is provided, there will be no overloading during rainy weather, as it is thought that the only surface water that enters the sewers goes through manholes when the streets are flooded.

The conduit system, as far as it has been constructed (including that now under construction) is adequate for all present or probable demands for the next twenty-five years, except the Kalihi outfall, which is undoubtedly a greater danger than the pump outfall, as this accumulation has no waves to break it up and no current to carry it away, and should be extended across the Kalihi Bay to deep sea water. The pumping plant has been added to, and kept going from scanty appropriations. The original design was faulty and inadequate if we require the extensive plant now in use.

The station should be extended and proper and sufficient plant installed to take care of the present flow, mechanical screens

should be installed with proper appliances for their control; with this, some mechanical method of removing the materials retained on the screens.

If this is done and the water meters installed, it is believed the area intended to be accommodated by the present trunks will prove sufficient for the next twenty-five years, but the laterals should be extended to take in every piece of property in the district included for these trunk lines. The Manoa, Palolo and Kaimuki sections should be sewerred at once and connected to a pumping station near Fort De Russy.

A pumping station should also be built at Kalihi, the main extended across the bay and the system extended to take in every lot in the district.

It is difficult to imagine greater folly than to collect all the sewage, excrementitious, or human refuse, and other waste matter necessary to human habitation of this city and dump it on the reef in close proximity to the harbor entrance. The discharge sewer from the pumps has been broken and rolled out of position and all of the sewage is discharged on the reef in approximately 18 feet of water, where the waves break and drive it back towards the harbor entrance and along the shore to Waikiki; and where it undoubtedly infects the harbor and shore line and will eventually form banks of black, infected mud, as was the case in the estuary of the Thames due to London's sewage thus neglected.

It is not possible to state when this break occurred, but it was undoubtedly shortly after its construction. No sea food taken within reach of this pollution can be used for food without great danger, nor is it safe to wade or bathe in its pollution, and the distance it travels is indeterminate.

Perhaps some one can explain why this condition has been permitted to continue. We are unable to ascertain. The only possible excuse for its existence and continuation is probably lack of information as to the danger therein, and brands the community as one willing to tolerate such nuisances and content to permit false impressions.

The manhole covers were perforated and dust pans provided according to the very best practice and in no case should covers be plugged. The pans should be inspected and emptied at regular intervals, and after each rain they should be emptied of water and.

if oiled, it should be done with a light petroleum and never a heavy or crude oil, as it finds its way into the pipes and sewers and is most dangerous in forming a stoppage.

Grease traps are a necessary adjunct to any properly designed sewer to prevent grease entering the sewers.

Rudolph Hering, the expert employed to design the sewer system, stated that "the only proper method and least expensive one for the disposing of the sewage of Honolulu is by a discharge into the ocean at such a point, and under such conditions that a thorough dilution may be obtained." He said: "All of the sewage should be screened before it is discharged so there will be no floating matter left to drift about on the surface of the ocean. Any floating matter carried in the sewage should be retained by *double screens* before it reaches the pumps, and may be *removed as it becomes necessary*. Any fine, solid particles passing the screens will be further commuted in passing through the pumps and will be discharged at the outfall in a condition to prevent their rising to the surface through 100 feet of water. The bottom of the ocean at the proposed point of discharge slopes downward to a great depth. There is no question but that all the sewage so discharged will disappear."

Now, handling so large a quantity, we ignore the advice given and the screens are not in use. The reason given is that there was too much screening to handle. We recommend that screening be continued unless the outfall is repaired so as to discharge into 100 feet of water; in which event, unless serious nuisances occur, it would seem that the system would be practical and efficient.

CHAPTER 9.—DRAINAGE (MAP).

SECTION I.—EARLY EFFORTS.

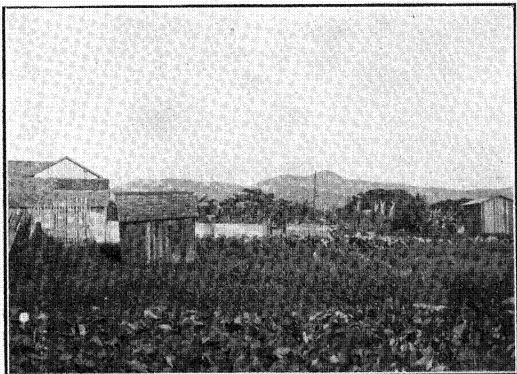
In the Session laws of 1876 there is an Act permitting those who desire to drain wet lands and find it necessary to cross other land, to do so by petition to any Circuit Court Judge, praying for right-of-way. The delays and technicalities of the law were evidently cumbersome even at that time, for in 1882, Agent J. H.

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Brown stated "that the Board of Health should have the power to cut drains across property to drain off pools of stagnant water, which can be gotten rid of in no other way." Next in 1888, Dr. Emerson, President of the Board of Health, said: "There are places with stagnant water within the town limits which should be filled. Most of them belong to people too poor to fill them and the lots are not worth the outlay, but some action should be taken to stop these nuisances."



WATER CLOSET BETWEEN TWO TARO PATCHES

In 1890 reports show that a large coral stone drain was built by H. F. Hebbard, Road Supervisor, carrying the surface water from Beretania across King and South Streets. Intercepting ditches were built around the entire base of Punchbowl to Makiki gulch, draining the top and interior of Punchbowl, and two new drainage ditches were opened on the plains from King Street to makai.

That due consideration to the large rainfall in brief periods was not given is illustrated by the announcement of W. E. Rowell that "both Punchbowl and Makiki ditches broke and overflowed during 1890 and again in 1894."

In 1896, C. B. Reynolds reported to W. O. Smith, President of the Board of Health, "that, due to cholera, much has been done to improve conditions, the straightening of Nuuanu Stream, the reclamation of swamps at Leleo and the removal of wash-houses." This year an Act was passed to provide for improvement of land in Honolulu deleterious to public health, and for the creation and foreclosure of liens to secure the payment of the expense incurred. This gave a long and technical method by which the health authorities in their discretion could begin proceedings by notice to the Minister of the Interior, "who is to serve the owner of the property with notice and grant time in which to make improvements." There is right to appeal to a board of three citizens, who as experts pass on the action of the health authorities. All liens are good for only three years:

In 1897 the report of Rudolph Hering, civil engineer, on plans for a sewer system for the first time forcibly brought to public attention the necessity of drains for surface and storm water; not only because of the unsanitary conditions they created, but also because of the damage to streets. Hering, in his report, states "that from four valleys the surface water naturally flows to the sea. In each the quantity will be too great to allow it to flow on the streets, therefore provision should be made for underground channels." He then recommended four additional drains in town to provide for the surface water, "these should be built to the sea, with walled sides and paved bottoms." He thought the less densely populated portions of the city could be left without objection for some time. He stated "that the velocity desirable in drains, when run half full, is at four feet per second, so as to be self-cleansing. Drains should be circular in shape with smooth interiors and regular curved sides." This resulted in more culverts of a permanent nature.

In 1901, Marston Campbell, Road Supervisor for Honolulu, called attention to the neglect of storm water drainage. "There being but few small drains and catchment-basins where there is a congestion of water. In no case are these adequate. In stormy weather the streets are impassable. The growth of the city lessens the absorbent area and turning additional roof water into the streets increases the difficulty." He, however, told of the con-

struction of Kukui storm drain and of similar work progressing in Fort Street and one in Alakea Street.

In 1902, C. B. Dwight, Road Supervisor, showed that culverts, drains and catch-basins had become recognized necessities, and about this time was the first mention of the home manufacture of cement drains.

In 1904, the Makiki ditch walls were built in concrete, and the report of 1905 showed construction of storm sewers down Victoria Street from Kinau to Spencer, making a total of 19,804 lineal feet of storm drains in operation. In July the counties took over the street work, although the Territory completed from the loan fund the Liliha Street drain in 1906.

In 1911 the Unsanitary Land Act of 1896 was considerably amended. It was made to apply to the whole Territory. The time allowed in which to begin improvements was reduced to twenty days and in many ways it was patched up and improved. It still provides for a board of three citizens to pass on and determine if the land is really deleterious to public health, making them experts superior to the health authorities. The law is long and technical and it remains to be tested in the Courts, and to be tried by able lawyers.

SECTION II.—RAINFALL.

To illustrate the excessive rainfall in short intervals and the necessity for large surface drains, we cannot do better than republish the following letter:

Government Survey,
Honolulu, T. H.,
June 24, 1897.

Mr. F. S. Dodge,
Hawaiian Government Survey,

Dear Sir:—From the official records of the Weather Bureau, I cull the following examples of flooding rains in Honolulu:

In February, 1893, there fell on the 2d, 2.30 inches; on the 3d, 5.16 inches (within about eleven hours); on the 5th, 1.35 inches; on the 6th, 1.90 inches; in nine consecutive days ending February 10th, nearly 14 inches.

In November, 1893, there fell on the 19th and 20th, 5.66 inches of rain, falling in two principal showers, at the rate of *nearly an inch an hour*.

On the evening of May 3d, 1892, there was a thunder shower with a rainfall of 4.35 inches, nearly all of it in less than *two hours'* time. Water in the principal streets of Honolulu was 6 inches deep where there was not a heavy grade. This is the heaviest rain I myself have seen in Honolulu in recent years.

I remember one, many years ago when no records were kept, in which there must have been a rainfall of more than 10 inches, much of it at the rate of 1 to 2 inches an hour.

On May 10, 1885, there was a rainfall record of 10 inches of rain; time occupied in falling not stated. In the heavy rain of December 30 and 31, 1896, the total rainfall in 24 hours was between 6 and 7 inches, of which 3.50 inches fell in *nine* consecutive hours, and after an interval of ten or twelve hours there was a downpour of about 1.25 inches in *less than 40 minutes*.

In the heavy rains it may be stated that a rainfall for several consecutive hours of half an inch an hour is common; 1 inch per hour is less frequent, but may be expected, perhaps, once a year. Rains at the rate of 2 inches per hour are not exceptional, but occur as often as once in ten years, perhaps, generally lasting, however, less than an hour, but frequently preceded and followed by rain at a more ordinary rate.

Yours very truly,

(Signed) A. B. LYONS.

Since 1897 the records show the greatest recorded rainfall in any one day in Honolulu to have been on March 16, 1908, when 5.04 inches were measured by the Hawaiian Section of the Federal Weather Bureau under Wm. B. Stockman.

Taking the maximum daily rainfall each year from 1877 to 1884, the average is nearly 4 inches.

SECTION III.—NATURAL.

The District of Honolulu is located on the southern end of the Island of Oahu, occupying the entire space between the main ridge of mountains and the sea, beginning with the ridge between Moanalua and Kalihi Valleys and ending in the southerly direction at the boundary of Maunalua not far from where the main ridge ends at the sea.

It contains some 44,000 acres out of 384,000, or a little over one-eighth of the Island.

The northeast boundary is the summit of the main range varying in altitude up to 3,000 feet, cut with many ravines and valleys, five of which have running streams of water. Within the area are two hills (extinct craters) one at the sea's edge projecting the coast line into the sea and rising 760 feet, the well-known point of Diamond Head. The other, Punchbowl, of about 500 feet elevation, is at the base of the foothills, a little to the left of the center of the whole area.

The five main valleys with running streams are: Kalihi, Nuuanu, Pauoa, Manoa and Palolo.

Kalihi is not yet sufficiently populated to consider surface drainage except along the main thoroughfare of King Street.

Between Kalihi and Nuuanu towards the sea is a wide area of flats, which are drained by the Kapalama Stream rising in an enclosed spring at the upper end of the Rice Mill Road.

Nuuanu Stream has two branches which join above School Street and below Kuakini, the north branch rising just above the Country Club, and the east or main branch starting at the big new storage reservoir above Luakaha. The Pauoa Stream flows into Nuuanu Stream below Kukui, thus the Nuuanu outlet drains the areas of Pauoa and Nuuanu Valleys, and the westerly slopes of Punchbowl. It takes but little of the central portion of the city because of the rise or old reef near Kukui Street. Roughly speaking, it drains the town area, below the valleys, bounded by Liliha Street on one side and on the other by Emma, Vineyard, Fort and Beretania Streets.

Manoa Stream, after draining its valley, crosses Waialae Road and spreads out in the flat beyond the old Moiliili church, where it supplies part of the water for the rice and taro fields below.

Palolo, after draining its valley, turns abruptly towards the city and crosses the Waialae Road in the same flat near the Manoa Stream, mingling its water in the vast flat enclosed by the slope of Diamond Head, the slopes of Punchbowl, the foothills of Makiki, Manoa and Palolo, the higher portions of which have been built upon and form some of our choicest residence districts of the city, the lower portion of which are still swamps and compose Kewalo, Kalia and Waikiki districts.

The swamps back of Waikiki are drained by five openings to the sea, two at the entrance to Kapiolani Park, one at the Moana Hotel, and two at old Waikiki. The one at the Japanese Club is connected with that of the Piʻiniao Stream in Kalia.

There are accordingly eight natural drains into the sea—the five at Waikiki, Nuuanu into the harbor, Kapalama and Kalihi Streams.

SECTION IV.—ARTIFICIAL.

The necessity of protecting city streets from the storm water that flowed off the slopes of Punchbowl, caused the first extensive attempt to direct or control the waste storm water.

From Prospect Street westerly a ditch, enclosing nearly half the hill, carries the water to Pauoa Stream. The top and easterly slopes of Punchbowl, naturally drained by gulches towards the sea and across the plains, are now artificially drained, their water being diverted across into Makiki gulch, and crossing Wilder Avenue, Beretania and King Streets, flow along Kalakaua a short distance, emptying into the swamps at Pawaa, Waikiki. Formerly this Makiki water crossed the Waikiki Road and ran more directly to the sea; since this addition there has not been any attempt made to free the Waikiki swamps of this water or that of Palolo and Manoa. Heretofore the swamp has been used for rice culture and the area of wet land increased whenever possible. Waikiki residences have built up a high barrier between the swamp ponds and the sea, and some of the old outlets have been closed up. The grades of Kalakaua Avenue and the old Waikiki Road have been raised and additional culverts put in across it, as the backing up of the storm water indicated the necessity of so doing.

Sheridan and Ward Avenues both have open, walled ditches that drain a large area of the old plains.

Upper Liliha Street has two ditches to carry off the water that drains towards the street from each side; they join at above Vineyard, cross a block and Kukui Street, then flow through the center of the next block, crossing Beretania Street into the middle of the triangular block above the depot, and stand there overflowing into a closed drain along King Street into Nuuanu Stream.

Lower Liliha Street has been considerably raised and the side away from town has a drain that catches the overflow from the taro patches at Parker Lane, near Vineyard Street, takes also the water from Kanoa Road, crosses King Street just beyond Liliha, empties into the ponds and swamps below, and finds an outlet along the railroad track into the sea beyond Iwilei.

With these main ditches there are a large number of street culverts and drains caring for the water that congests, during the rains, throughout the city, and discharging it into the natural streams and dry gulches or into the sea or harbor.

SECTION V.—SWAMPS.

In the District of Honolulu the low lands along the sea from one end to the other, a distance of six miles, are mostly composed of alluvial deposits from water erosion gradually having filled in the area enclosed by the reef, thus making along the waterfront a series of swamps extending inland, wherever the surface is sufficiently low in level.

Thus we have Kalihi swamps, salt flats and shallows, with a considerable area under water at high tide. Then come the Kapalama swamps from Kalihi to Iwilei, the latter being a remnant of an old reef, punctured by Nuuanu Stream, but continuing through the town across to Kukui and Fort Streets. The easterly side of the harbor was once a swamp called Waikahalulu flats, which were filled in the early 80's from Queen Street down, composing what was called for so long the esplanade and now forms our main steamer and naval docks.

Kakaako has gradually been filled and drained, but much still is below the level. Kewalo, where it emerges into Kakaako, presents a swamp district of grave importance, for being nearest the city it has been built upon and occupied by the working people. The ponds just below King Street beyond Alapai have been infected with cholera.

Beyond Kewalo lower Kalia forms a large swamp of waste area, while Waikiki swamp spreads for miles below Kalakaua Avenue and above, off to the flats where Palolo and Manoa Streams unite.

To all these natural swamps have been added areas where wet agriculture has been practiced, until today it is difficult to define the area which forms the natural swamps, nor can the source of the water in the swamps be definitely determined without proper surveys and measurements. Certain springs are known, but by far the greater volume of water comes from the valleys and artesian wells.

The total area of wet land, excluding the valleys, is one-third the area below the foot-hills.

SECTION VI.—NEED OF PLANS.

A glance at the map and a study of our present surface drainage shows how little attention has been paid to the proper disposal of storm water, and where any improvements have been made they were prompted by the *immediate* need and executed without due regard to the immense rainfall or any comprehensive plan, owing to lack of sufficient money. A method that is always certain to cost a far greater sum than is necessary, requiring changes and enlargements that could be avoided and saved, if money were available for plans and studies, and each portion was built as a part of a definite plan.

The carrying of surface water off Punchbowl by intercepting ditches along the foot-hills into Makiki gulch takes an immense quantity unnecessarily and unwisely into Waikiki swamp above Kalakaua Avenue. This should be diverted directly into the sea. The closing of the old outlets into the sea at Waikiki and the partial filling back the storm water up and force it to find new channels at the point of discharge.

On our map the City and County Engineer, G. H. Gere, has made some valuable suggestions of drains that should be built at once, in order to prevent the necessity of filling of low lands and in order to dispose of storm water after any filling is done.

SECTION VII.—WET LANDS.

Heretofore wet agriculture has extended in every direction, reclaiming wet swamp areas and absorbing flats which could be irrigated by gravity or from artesian wells, wherever a profitable crop of rice, taro, or lotus could be grown. The area occupied has only been reduced as parts of it became more valuable for other purposes.

The cause of change in economic value is sometimes due to the fall in value of crops, increased cost of labor, or the enhanced value of surrounding lands for dwelling or other purposes.

The increasing knowledge of the immense loss due to mosquitoes is now putting wet agriculture to a still more severe test, and we are beginning to inquire if against the value of crops should not be set the loss due to mosquitoes, and the easy spread of contagion.

Another serious defect in our method of wet agriculture within the city limits, is that we permit dwellings to be used, which are surrounded with standing surface water, without provision for proper sewage disposal, thus enhancing the danger of water infection, and the possibilities of typhoid and cholera.

We believe the wet land problem presents a serious and difficult question, the economic aspect of which cannot be ignored. We are unanimous in the opinion that wet agriculture in the city limits should be stopped. One plan is to select an area surrounding the center of the city in which the raising of crops on wet land or in water shall be prohibited, and gradually extending this limit. Within the area put many stricter regulations in force, making it more metropolitan in character, and giving free garbage service, and increasing the value of the land for dwelling purposes by cutting new streets, providing better access, better fire protection, water, and sewer service.

Another plan is to permit the owner or taxpayer to elect how he wishes to use or classify his land for the ensuing year in his returns to the tax office. Then prevent the occupation of houses or groups of dwellings that are immediately surrounded by wet agriculture, so that no dwelling can be occupied that is within a given distance of wet agriculture, and that all dwellings must be located on land above a certain level, fronting on some street or alley owned and cared for by the municipality, and thus reduce the danger from infection by surface water.

If a citizen dries up his wet land and makes it available for city use and concludes to wait for a tenant or a purchaser, should he, in all fairness, be kept in competition with the owner who still continues to secure a small return from wet agriculture?

One thing is certain, that we can best abolish wet agriculture in the city limits by making the land so used too valuable for such purposes. Money expended along such lines will often be of double value, as it will accomplish this object and furnish needed improvements. The land suitable for other purposes will be withdrawn from wet agriculture and the area gradually reduced.

Meanwhile certain swamps and low lands must be filled in order to protect our public health. Thus there will be a supply in excess of demand of land for dwellings, and the prohibition of dwellings on certain unsuitable low lands will not therefore work a hardship.

CHAPTER 10.—GARBAGE.

SECTION I.—OUR PAST.

A study of the Board of Health reports show that the credit for the first attempt to remove refuse and waste belongs to J. Mott-Smith, father of the present Secretary of the Territory.



WATER CLOSET IN VEGETABLE GARDEN—LETTUCE READY FOR MARKET
SOAKING IN DITCH-WATER PASSING CLOSET

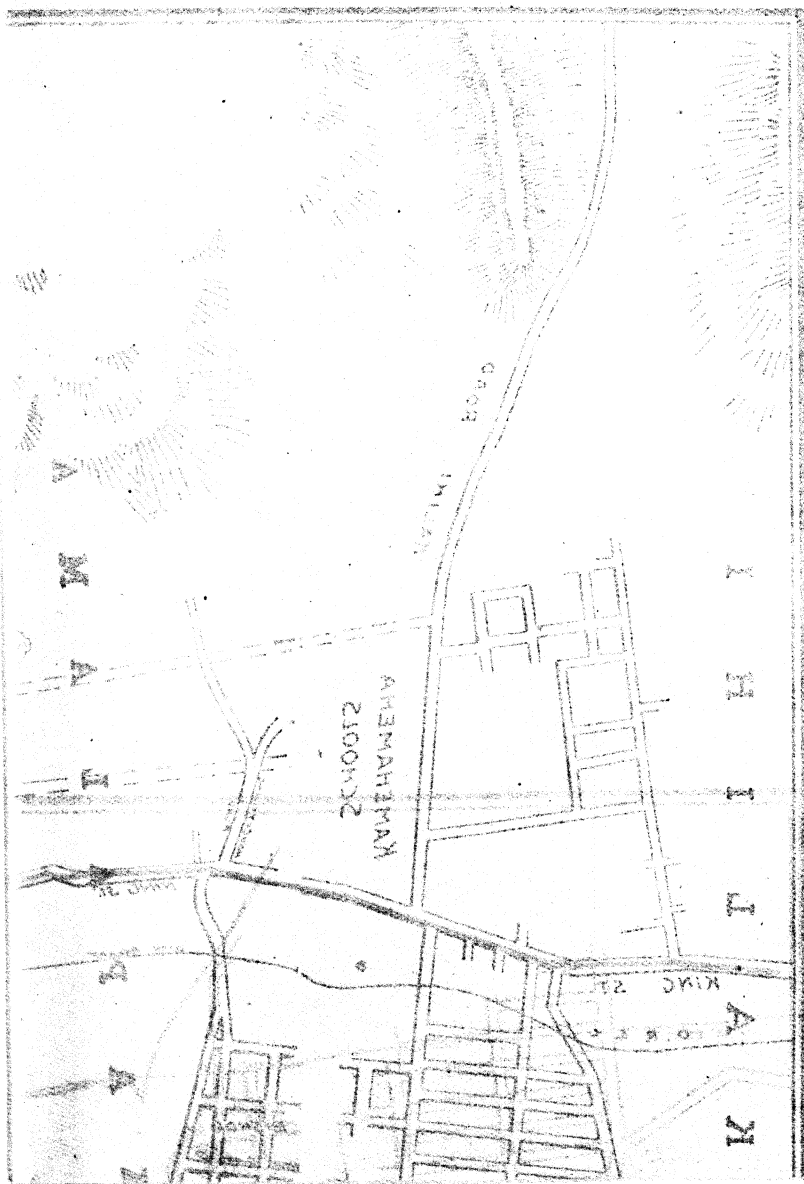
In the Board of Health report of 1878, President Mott-Smith stated "that a system of street cleaning has been under way since July 1st, at a cost of \$886.25 for one wagon during the six months."

In 1880, S. G. Wilder, President of the Board, stated "that street cleaning in Honolulu began July 1, 1878. It at first covered only the street area, and now includes the refuse from residences." He reported a cost of \$2,261.69 for two years.

In 1884, President W. M. Gibson reported free street cleaning, including garbage, for two years at a cost of \$6,861.

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In 1886 he deemed it advisable and transferred the control to the Department of the Interior of which he became the head.

In 1888, Dr. J. M. Kimball, President, stated that "the pay system is unsatisfactory, as many householders prefer the risk rather than to pay the fifty cents per month charge, with the result that the community suffers and filth accumulates in out of the way corners only to be found when intolerable." He thought garbage collection should be under the Board of Health; that its removal was absolutely essential to preserve public health, and that the expense should be borne by all in proportion to their ability to pay taxes. Dr. Kimball was the first man to suggest a furnace for the disposal of combustible waste.

The Interior Department reports make no mention of the garbage collection, but in 1880 they show that two four-wheeled wagons were in operation for removing street sweepings, indicating that the city was not kept free from waste except the streets only.

In 1892, President David Dayton of the Board of Health, stated "that the free collection of garbage (city waste) under the Board of Health began January 1, 1891; during the fifteen months to April 1, 1892, 3,877 loads or 9,620 cu. yds. were removed."

In 1894, W. O. Smith, President of the Board, received a report from Agent Reynolds, stating, "that the free garbage and excavator work is excellent, that previous to 1892 garbage was cremated at the works of A. F. Cooke, that since then it has been dumped in Kalia," and he recommended that it be covered with earth. Street cleaning for this period is not mentioned by the Minister of the Interior.

In 1896, Agent C. B. Reynolds reported to the President of the Board, that the cleaning of streets had been sadly neglected although some sweeping had been done. No records are given of the amount of waste handled, but the report states that "the cost of the garbage and excavator service from April 1, 1894, to December 31, 1895, twenty-one months, is \$9,440.78."

In 1898, W. O. Smith, still President of the Board of Health, reported that the work of removing waste was progressing at a cost for two years of \$15,025.28.

In 1900, Dr. C. B. Wood, as President of the Board, first sug-

gested that a garbage incinerator was necessary and that the dumping of garbage in Kewalo was vicious. Marston Campbell, the Road Supervisor under J. A. McCandless, Superintendent of Public Works, reported 18,504 cu. yds. of debris removed from the street area during the year of 1900 at a cost of \$8,000, this in addition to the garbage and excavator service.

In 1901, Dr. J. H. Raymond, President of the Board of Health, showed that 1,139 loads of garbage were removed and burned during November and December of 1900, and yet that the free service was unable to keep up to the demand. He placed the cost of garbage and excavator work during 1900 at \$33,302.70 and recommended that the work be let out by contract. During this year the Council of State made an appropriation of \$20,000 for a garbage crematory. Superintendent of Public Works, J. A. McCandless, contracted for a Thackery Incinerator erected for \$19,595, but the proposed site being objected to, the contract was cancelled, and \$16,844.59 was paid for material, leaving a balance of \$3,155.40 which was used for the increased cost of a foundation on the finally selected site below the sewer pumps. In July, 1901, the garbage and excavator service was again transferred from the Health to the Public Works Department.

In 1902, Sam Johnson reported to J. H. Boyd, Superintendent of Public Works, that the garbage and excavator service heretofore covered the area within School to Emma, and Alapai to River Street, and that neither the ashes nor the manure was removed, that he had added five double wagons, divided the town into districts, made certain men responsible for each portion, extended the area so as to include from Punahou Street to the Pacific Fertilizer Works and as far mauka as Judd Street, removing all refuse offered; that on October 1, 1901, a schedule of charges was established, and the system changed from a free back to the payment plan. Johnson reported 9,210 loads, or 23,025 cu. yds. of garbage collected; 2,352 cesspools cleaned, and 7,183,764 gallons of sewage removed during the year ending June 30, 1902, at a gross expenditure of \$43,563.41, which, less the sum of \$13,373.90 collected as fees, made the net cost of \$30,189.51.

In 1903, Johnson reported the extension of the area served west

of Punahou Street and that 11,400 loads or 23,500 cu. yds. of garbage had been collected.

In 1904, provision was made for daily visits within the area bounded by the Pacific Fertilizer Works, the McCully Tract, Judd Street and the waterfront. The charges of October 1, 1901, were readjusted, and 12,358 loads, or 30,895 cu. yds. of refuse were collected. Johnson's report shows that burning on the dumps on the Beach Road and in Iwilei had been carried on; that the excavators discharged at the Sewer Pumping Station, and that there was no towing of scows to sea, the market waste being burned in a temporary furnace.

On March 1, 1905, the garbage incinerator was completed at a total cost of \$26,564.88 and put into operation. Johnson reported for the year ending June 30, 1905, 13,371 loads or 33,427 cu. yds. of waste removed, and that four months' operation of the Thackery Incinerator cost \$1,605.66.

SECTION II.—COST OF MANAGEMENT.

On July 1, 1905, the County took charge. Since then there are no reports on the amount of work or waste collected, but the cost is given by Auditor Bicknell, as follows:

1905—Expenses (6 months).....	\$11,040.34
Received	4,701.96
	<hr/>
Net Cost	\$ 6,338.39
1906—Expenses	\$23,569.98
Received	8,874.70
	<hr/>
Net Cost	\$14,695.28
1907—Expenses	\$18,708.42
Received	10,294.20
	<hr/>
Net Cost	\$ 7,414.22
1908—Expenses	\$16,489.92
Received	11,636.05
	<hr/>
Net Cost	\$ 5,853.87

1909—Expenses	\$16,081.70
Received	13,254.75
	<hr/>
Net Cost	\$ 2,826.75
1910—Expenses	\$15,642.60
Received	13,558.35
	<hr/>
Net Cost	\$ 2,084.25

SECTION III.—PRESENT SYSTEM.

The area now served by the garbage system by districts and amount of service is as follows:

No. 1. From the fertilizer works on King Street, up Liliha to Wyllie Street, including Iwilei and all the section below School Street up to River Street, service twice a week with one double wagon.

No. 2. From Wyllie on Nuuanu to Beretania, from the stream to Punchbowl, including Pauoa Road and down Alakea, along King, and up Punchbowl, service twice a week with two double wagons.

No. 3. From Prospect Street down Hackfield, out Lunalilo, including all the area above on both sides of Wilder Avenue beyond Punahou to Metcalf as far down as King, and up Punahou Street, with three double wagons, giving all portions service twice a week and some portions three times.

No. 4. Along Kinau, Beretania, Young and King Streets, from Punahou Street to Kewalo and Kakaako, service twice a week with four double wagons.

No. 5. The central portions of the city comprising the waterfront, River, Beretania and Alakea Streets, daily service with five double wagons.

No. 6. Upper Manoa and the slopes of Punchbowl along Luso Street, service three times a week with six single drays.

Making a total area of approximately 3,000 acres.

The service aims to remove as regularly as possible with the limited equipment all refuse set out for collection by regular subscribers. The charges range from 35c to \$7 per month.

The equipment consists of thirteen mules and one horse, seven

wagons, one buggy, four excavator carts and five pumps, harness, etc., valued at about \$3,065.

SECTION IV.—COLLECTION.

Mr. Charles Egerton, President of the Sanitary Product Company, which purchases the refuse of some of our largest cities, says that "the disposal of waste and refuse of a city of only 50,000 people is difficult, because experience shows that it is only with cities of over twice that number that the value of the material approaches the cost of disposal, not to mention its collection." He claims the material must be divided into three parts; 1st, food waste; 2d, combustible waste; 3d, non-combustible waste.

Our record in handling the waste of Honolulu shows that we began in 1878 with a free service, and at the end of nine years changed to a pay service. Seven years thereafter the conditions had become intolerable and we returned to a free service under the Board of Health.

Within the next ten years the service became too extravagant, and it was passed over to the Public Works Department, under which in 1901 it became a pay service which has lasted to date.

During the periods of pay service there has been much complaint. The experience of other cities shows conclusively that a pay service is never effective, for many individuals prefer the risk and danger of infection, rather than pay the charges, no matter how small or reasonable. The waste material is then hidden or deposited in the nearest vacant space. It accumulates until it can no longer be concealed, or, if food waste, it decomposes and becomes a public nuisance. Finally the Board of Health or some civic organization undertakes a special campaign to remedy the disgraceful condition, and thus certain citizens succeed in having their waste disposed of without cost to themselves. The burden is therefore not as evenly or equitably distributed under a pay system as if the whole cost were a public charge—where each pays in proportion to his ability.

The work of the Central Improvement Committee on "clean-up day" illustrates the inevitable results of a pay system. We quote from the report: "Almost every district leader has taken occasion to recommend in his report a free garbage collection service

as the only remedy to the disgraceful and disgusting conditions found on June 24th last."

A free system is the only way to keep the city clean, to reduce the danger of infection, to keep down the number of rat harbors, and to remove the old cans, bottles, and containers likely to hold water and then breed mosquitoes. To quote again from the report on "clean-up day": "From our experience there seems to be a real desire and willingness on the part of the majority, regardless of race or condition, to live decently and it is the duty of the community to remove, in just so far as possible, all excuse for not so living."

We are unable to compare the cost per unit with the past or with that of other cities, as there are no published statements giving the volume collected. A letter from the County Supervisor in charge of service shows that 4,065 cu. yds. were collected in November under the stimulus of the mosquito campaign, but an average for a year is needed on which to base any judgment.

Elsewhere garbage is usually measured by weight rather than by cubic yards, for a wagon load of two yards may mean much or little. In 1901 the army authorities removed 6,852 tons of house refuse alone in Havana, street sweepings being kept apart.

The general average of waste material for all American cities is stated to be about half a pound per citizen per day when the collection is constant and effective.

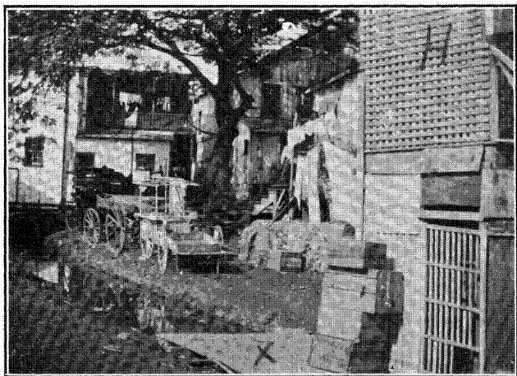
SECTION V.—DISPOSAL.

The disposal of waste in Honolulu has usually been simply to dump it on the nearest, most convenient low ground, and there let it decay and rot, only occasionally attempting to burn it.

The dump heap has always been the best rat-harbor, the rat catchers taking as many as thirty in a single night.

During four months of 1905 the garbage incinerator was operated, but it was closed down as soon as the municipality took charge because of the expense. Now, however, it has again been put into operation, and we hope its use will be continued until sufficient time has elapsed to give it a fair test. Incineration is the best and cheapest method of disposing of garbage, although self-dumping scows are used in some seaports.

On November 29, 1911, at the request of this Commission for his opinion of the best method of disposal of the city's waste, Dr. Rupert Blue said: "Your Commission should recommend the Meldrum Destructor System to be used in connection with the municipal free collection of all refuse. All garbage must be separated—the combustible from the non-combustible and all containers used for swill or food refuse should be sold by the municipality at cost in order to have them water, rat and fly proof."



SINK DRAIN FROM ROOM "H" IN ABOVE TENEMENT DISCHARGES INTO
STREAM UNDER PLATFORM "X"

Block just mauka of O. R. & L. depot

This statement led to an investigation of the Meldrum Destructor and we found that disagreement between authorities creates some doubt respecting the value of the various types of furnaces. The following are the most general in use:

CREMATORY—Is a furnace for burning garbage and refuse, mixed, but without ashes or non-combustible waste.

INCINERATOR—Is a furnace only for refuse and waste that is combustible.

DESTRUCTOR—Is a furnace that destroys all classes of waste together or in unsorted condition.

The use of destructors is not common in the United States. They are designed to maintain a uniform high temperature, and a utilization of the waste gases for some other practical purpose. They are of two types, cell destructors or separate burning chambers, and the continuous grate furnaces with burning-chamber common to all the grates. The Meldrum is an example of this latter class. In this furnace there is one long chamber common to all the grates, but divided so that each grate has its own ashpit and forced air supply, thus each grate and pit may be operated as a single unit. The charging is done periodically, so that when green material is put on one grate the others supply the necessary heat at once to immediately destroy the gases and smoke thrown off by this fresh charge. There are other peculiarities about the Meldrum that make it more useful—such as the use of a steam jet and exhaust heat for the boiler.

We append a table showing the number of each of the seven prominent kinds of destructors in use and the application of the heat to various purposes.

Some of the recent and more notable American installations of the Meldrum Destructors are as follows:

1906 Westmount, near Montreal, P. Q., successful and satisfactory.

1907 Seattle, Washington, satisfactory, net cost 28c per ton.

1908 Schenectady, N. Y., satisfactory.

SECTION VI.—STREET SWEEPING.

The destruction of the city's own waste from its streets is as important as that of the disposal of individual waste or refuse, and carries with it the responsibility which a municipality should evidence as an example to its citizens.

As Honolulu's population increases the necessity for better street cleaning and sweeping will become more important, and the proper disposal of such waste a more serious question.

These problems are of grave importance for the dust of our streets causes diseases, among which are colds, pneumonia and

laboratory. The habit of skirting furnishes the street dust with mixed particles from the discharges of the motor, horse and tread of infested individuals. The discharges from the animals used in driving along our streets are

Meldrum 80



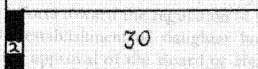
Manlove 67



Horsfall 67



Warner 32



Heenan 22



Hughs Stirling 8



Baker 4



KEY.





-  Combined with electric works.
-  Combined with sewage works.
-  Combined with water works.
-  Not combined with power plant.

Chart British Destructor Plants.

Present total about 350 plants.



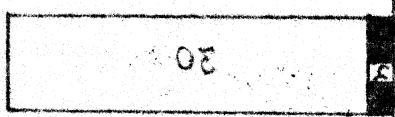
Meldrum 80



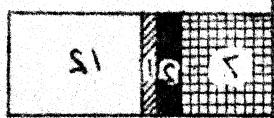
Manlove 67



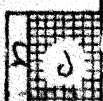
Horstell 67



Warner 37



Heenan 55



Stirling
Hudgins

Baker

Chart British Design
not total about

tuberculosis. The habit of *spitting* furnishes the street dust with dried particles from the discharges of the mouth, nose and throat of infected individuals. The discharges from the animals used or moving along our streets are also ground into the dust that we take into our systems. The safest and best plan is to burn all street sweepings in a destructor.

The cost of street sprinkling and sweeping may be less with paved roads, but a tropical city above all others needs to have its streets constantly washed and the dirt swept up as fast as it collects.

Money spent economically for clean streets brings bountiful returns in health among those for whom the municipality is created.

CHAPTER 11.—REGULATION OF FOODS.

SECTION I.—EARLY REFERENCE.

The public protection of food and milk through regulation and inspection is one of the most modern functions adopted by our local authorities. The earliest efforts toward the regulation of food supply was in 1868, when the establishment of slaughter houses was prohibited, except after the approval of the Board of Health. No further public attention was given to this important matter until 1882, when the Legislature first attempted to regulate the sale of milk. The law passed, however, did not reach those who kept cows for private use and sold only surplus milk, nor was it properly enforced.

This was followed in 1888 by an attempt to control the manufacture of poi, the principal food of the natives. This statute provided for the erection of a central poi factory in which all the manufacture of poi within certain city limits was to be confined. This law was to become effective as soon as the building was completed. As there never was any building erected, the effort was without result.

The next public suggestion in the Government reports for further control of foods is that of C. B. Wilson, clerk of the market,

who in 1890 recommended the inspection of all foods sold in the markets as well as inspection of animals to be slaughtered.

In 1892 the Government veterinarian investigated the effect of liver fluke in beef cattle, and reported it harmless except, of course, as to the infected livers found in the markets, which were destroyed.

The Legislature of 1909 provided by resolution for a Milk Commission. The Governor appointed James A. Rath, W. D. Baldwin, M. D., and F. G. Krauss as members of this commission which made a thorough inspection and splendid report in 1910. They found the sanitary conditions of our dairies most unsatisfactory. Their report deserves greater consideration than it has received.

In 1910, the Health Report announced the death of R. A. Duncan, Food Commissioner, in June, and that no successor as yet had been appointed, and that the municipality had taken over the fish, meat and cattle inspection and that dairies were being inspected in coöperation with the Federal and Territorial Food Commissioner.

Fish inspection began in 1894, according to President W. O. Smith (see page 10, Report of 1896), and was most vigorously enforced during the cholera epidemic of 1895.

In 1906 the general license law was extended so as to cover the sale of milk, providing a fine for the sale of skimmed or adulterated milk and giving power to inspect as well as to confiscate when adulterated milk was found.

In January, 1886, the regular inspection of beef was begun, and at the end of 1897 appeared the report of W. T. Monsarrat and J. R. Shaw, veterinary surgeons, on tuberculosis in beef cattle. The first regular report on meat inspection is in the Health Report of 1898.

On May 16, 1898, under the Republic of Hawaii, the first Pure Food Act was approved by S. B. Dole, and E. C. Shorey became Food Commissioner, continuing until June 30, 1904.

In 1903 the Pure Food Act was amended so as to prohibit the use of preservatives and so as to adopt a general standard of milk.

In 1904, L. E. Pinkham recommended new laws giving greater power over the environment of milk and poi. R. A. Duncan, Food

Commissioner, from July 1, 1904, reported milk and certain foods examined as well as on water analyses, it being evident that meat and fish inspection had been more thorough.

In 1907, the Food Commissioner pointed out the necessity of power to control the sanitary conditions (environments) of dairies. During the year ending June 30, 1908, 43 dairies supplied the city with milk.

SECTION II.—INSPECTION OF BEEF, FISH, MILK.

The inspection of beef and fish since 1909 has been under the municipality and as yet no printed report of the work has been made.

In addition to the beef and food inspectors in the city proper, there is also one for the country districts of the Island of Oahu. The city maintains two fish inspectors as well as a milk inspector who assists the Federal and Territorial Food Commissioner.

The Federal Bureau of Chemistry under the Department of Agriculture and the Territory combine on the appointment of a Food Commissioner who looks after the chemistry of foods and drugs, both of home manufacture and those imported. The only standards which the Territorial laws now specify are those of poi, milk and dairy products, ice cream, etc.

The report of the Food Commissioner for 1911 shows a total of 369 stores that handle foodstuffs, 51 poi shops, 13 bakeries, 4 soy factories, 3 macaroni factories, and 1 meso factory.

SECTION III.—SOURCES AND CONTROL OF MILK.

The supply of milk being so important a factor with reference to infant mortality and there being 245 deaths in Honolulu last year of children under one year of age (about 22 per cent of all deaths), the Commission has made a special study of the subject and for its information secured during October a new inspection of all dairies.

This inspection showed 50 different sources of milk—that is, places where more than one cow was kept and milk occasionally sold. (For list see appendix.) The number of cows milked was 915 and from them approximately 5,476 quarts of milk sold daily, an average of not quite six quarts to the cow.

At present the control of the milk supply is under both the

Territory and County. The Territory's Pure Food Act of 1898 prohibits and defines adulteration of milk. The amendment of 1903 prescribes a standard of $2\frac{1}{2}$ per cent butter fat and $11\frac{1}{2}$ per cent solids; violations are made misdemeanors, punishable by a fine of from \$10 to \$100. County Ordinance Number 17, approved March 21, 1910, requires a permit (no fee), defines impure and adulterated milk, and adopts a standard of 3 per cent butter fat and $8\frac{1}{2}$ per cent solids, excluding milk fat, with other conditions; violations being misdemeanors and conviction resulting in fines of not less than \$10 or over \$100, or imprisonment of not to exceed three months, or both fine and imprisonment.

From the special milk inspection made it was found that 41 dairies used city water, 3 had private artesian wells, and 4 were using surface water.

One located in Manoa used a mud-hole, unprotected from surrounding surface drainage, as the source of water for washing utensils. Three located on King Street, not far from the old baseball grounds, used wells about seven feet deep unprotected from surface drainage, and within a short distance (50 ft.) from their pig-pens.

It ought not to be necessary to continually inspect the source of milk. Public expense is sufficiently taxed, if the milk itself is inspected and tested. The condition of dairies, the environment of the milk, should be prescribed by law, and heavy penalties provided for violations, as there is no neglect more reprehensible than that of allowing the innocent and helpless to be fed with polluted milk.

As milk is often the means of transmitting typhoid and other disease, no one who is ill should be allowed to come in contact with the milk or its containers. No person should do the milking, handle the milk or containers, who is sick or whose hands are wounded so that the skin is broken, nor should containers of milk be taken from a place infected with disease to any other place.

Another serious defect in the protection of the milk supply is the careless indifference to the use of milk from cows infected with tuberculosis. We should in justice to those who have dis-

posed of their infected cattle, without compensation, require a heavy penalty from those who do not do likewise.

The divided responsibility between the Territory and Municipality is a serious defect. The duplicity of standards illustrates the evil of double control, and those who suffer or complain are referred from one to the other authority.

SECTION IV.—PROTECTION.

The endeavor to prevent the public from being served with adulterated foods, poi of poor quality at high cost, milk that kills instead of nourishes, meat that is flyblown, and fish that is decomposed, is not supported as it should be.

This is well illustrated by the attempt to fly-screen the market and the utter indifference of many customers. Some seem to prefer meat that is exposed to dirt and dust as well as flies rather than change to a dealer who attempts to provide decent protection.

Again, some customers demand the privilege of poking or feeling raw meat and fish with their fingers and are perfectly willing to accept both treated in the same way by others, forgetting that certain hands may not be clean, that some may be diseased, thus perhaps unwittingly and innocently setting an example which spreads the contagion of various diseases, of which unknown to themselves they may already be victims.

E. B. Blanchard, the Food Commissioner, in his last report points out that the handling of raw fish is even more careless than that of meat. Much of our fish now comes from a distance on ice, so it is often, on arrival, several days old when exposed to our normal but high temperature. At the market iced fish is put on warm tables and exposed in the warm air sometimes all day. Thus it is often decomposed before it is eaten.

The remedy lies with the customers. In time they will learn to give their trade to the dealer who screens and refrigerates his beef, or to the fish dealer who keeps his fish on cool tables under glass at a low temperature and who allows none to touch or handle his wares. The dealer will eventually learn that clean, honest wares and high reputation are of more value to him than the immediate sale of a permanent or doubtful supply. At pres-

ent the customer is indifferent and the dealer lacks integrity, while the authorities do not sufficiently control the situation.

SECTION V.—VEGETABLES.

If those in Honolulu who delight in fresh vegetables and strawberries the year round, were only to visit the gardens where they are raised, inspect the water where they are washed, and examine the system by which they are fertilized, there would be no difficulty in forming a "Consumers' Pure Vegetable League," under which some method of guaranteeing the purity of the vegetables could be devised, and by which the patient Oriental truck gardener, who has succeeded where others have failed, would greatly increase his sales.

On May 27, 1911, this Commission visited the district into which Parker Lane leads from Liliha Street, and there saw a truck garden, where the stream which furnished the water in which the vegetables were washed, first ran within two feet of a privy vault in which a liquid mass of human feces and maggots floated at the level of the stream. The reader can draw his own conclusions as to just what would happen when the level of the stream receded.

It is dangerous to eat raw vegetables in Honolulu under present conditions due to the custom of storing up human excreta for use, either as fertilizer or in solution for irrigation.

In the City of Hong Kong the necessity for vegetables cultivated in a sanitary manner has brought about a special garden with special service direct to private houses.

Health officials cannot stop the Oriental customs without the universal coöperation of the housewives.

Because vegetables are supposed to come from the head of some valley, does not necessarily assure them as being free from infection. Because, from investigation and questions, you have been once convinced that your vegetables are pure, does not always protect you.

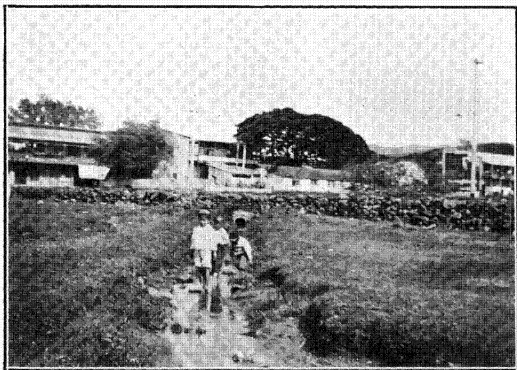
You would not feed poison to your children or any one of your household. You would not leave it unmarked about the house, yet some of the most deadly germs may be in your ice-chest even now as you are reading this.

Dr. Currie's report on the conditions he found in upper Manoa during the cholera epidemic in February, 1911, is indeed a severe indictment on the sanitary conditions tolerated. Add to those conditions the fact that it is often to these very gardens up in the valleys that carriers, fresh from infected ports, go to visit friends and the danger of sudden infection can be better realized.

CHAPTER 12.—LIVING CONDITIONS.

SECTION I.—THE PAST.

Living conditions did not become an important question to the people of Honolulu until the density of population became great



BOYS PLAYING IN THE STREAM PASSING BY HONOLULU ATHLETIC PARK

within certain portions of it. The copper plate engraving of Honolulu made in 1839 at Lahainaluna shows scattered houses and no evidence of congestion. Paul Emmet's series of pictures from the Catholic Church in 1854,* shows that the town then cen-

* See "Friend," November, 1854, Page 72.

tered about the lower end of Nuuanu Street. No houses are shown beyond River Street nor is the Waikiki side of Fort Street built up. Numerous and extensive gardens appear to be quite a feature of the town, especially between Beretania and the waterfront.

The constant and material growth of Honolulu began as a result of the Reciprocity Treaty with the United States. The census of 1878 gives the population as 14,114. Captain Brown, health officer, then reported that of the deaths which occurred in Honolulu 60 per cent were without medical attention of any kind during their sickness.

The period of 1880-1881 was noticeable because of the spread of measles and typhoid fever and the passage of an Act, providing sanitary conditions of dwellings, which first regulated air space. This Legislature also passed the first Act to regulate and control laundries and wash-houses, as well as poisons, and poisonous drugs. Captain Brown in 1880 stated that "the cleaning of streets since 1878 has been of great benefit."

In 1882, he first called attention to the necessity of cutting new streets to relieve the congestion and permit the admission of the excavator service begun June 1, 1881, as well as to give fire protection.

In 1882, the first fire limits were established in which some attention to construction of buildings was attempted. These limits began at the waterfront 80 ft. east of Nuuanu Valley Road; thence to King Street; thence along King Street 80 ft. beyond Fort Street; thence to the sea.

In 1884 eight new wash-houses were added to the sixteen on Nuuanu Stream.

The congestion of the Orientals and poorer people gradually overcrowded the area formerly called Chinatown between Nuuanu and River Streets. By 1885 the city had nearly 21,000 people and the death rate averaged 40 per 1,000 for the previous ten years.

In 1886 came the big fire of April 18, that swept clean this overcrowded portion of the city. This was Honolulu's first great opportunity to rebuild slowly, carefully and thoroughly, but the policy of the "present best" at future cost prevailed. Cheap,

wooden buildings outside the fire limits again crowded and cramped each other. Additions and lean-tos were made until the original buildings could no longer be recognized.

In 1886, W. M. Gibson first publicly stated the necessity for controlling poi shops by centralizing them and the desire for more stringent regulation of wash-houses. He pointed out that the great fire should be a "blessing," but the Legislature changed the fire limits only by adding the area from King Street up Smith Street to Hotel; along Hotel to Alakea Street; thence to the sea, including very little of the Oriental quarter which then extended to the stream.

Captain Brown reported consumption increasing; that one in every eight deaths was due to this cause.

C. B. Reynolds suggested the control and size of cesspools and the abolition of wooden sidewalks.

This period shows the first attempt at school inspection.

The Board of Health Report for 1888 by Dr. Emerson showed that the health authorities were without power to take advantage of the great fire. So simple a precaution as keeping open cesspools out from under houses was ignored. Public opinion, custom and law then permitted immense vaults to be built sometimes as large as 18 ft. in diameter and 25 ft. deep in which was deposited all food waste and human refuse; when decomposition took place mosquitoes bred and all kinds of vermin collected.

All efforts resulted only in an Act passed to control the erection, repairs and moving of buildings within certain wide limits, requiring a permit from the Minister of the Interior.

It is noticeable, however, that the average death rate for the ten years following the great fire fell from 40 to 25.38 per 1,000.

In 1890, Dr. Kimball, President of the Board of Health, reported the first use of regular sanitary inspection. He stated that "eternal vigilance is the price of a clean, healthy town as well as of liberty." He showed that in 1884 the Legislature decreed free medical attendance and medicines to all with native blood and that this law was abolished in 1888. He urged better conditions for the manufacture of poi.

In 1892, David Dayton reported the necessity of removing wash-houses from Nuuanu Stream. Agent C. B. Reynolds said

that "the new law of 1890 for licensing restaurants and lodging houses had greatly benefited sanitary conditions."

In 1894, the first fish inspection began, previously no protection to the public was thought necessary.

In 1895, came the first cholera, resulting in the first real cleansing of the city under voluntary citizen direction. This resulted in the removal of the old, dilapidated fish market, which stood on the harbor front near the end of River Street.

In December, 1899, the first case of Asiatic plague occurred, and in January, 1900, the second big fire. Again the "present need" largely prevailed, for although building restrictions were required for the burned district, yet many cheap tenements were erected across Nuuanu Stream beyond River Street, where they still remain a disgrace to our city. Again the death rate fell after the fire.

Not only did the great epidemic and conflagration reduce our death rate and hasten the installation of sewers, but with the latter came the improvement in plumbing, which began under the Board of Health Regulation of January 26, 1900, and the first inspection was approved November 7, of the same year. The task was tremendous, for previously plumbing was simply to provide connection with the cesspools and the danger due to defects was limited to small areas. Little attention was paid to the advance in methods or quality of material used, and the general conditions were indeed bad.

Since 1900 the improvement in living conditions has been constant, the public generally accepting the change. Plumbing is now a matter of inspection and control. Duck ponds, as well as pigstyes, are now considered nuisances.

In 1902, the slaughter-houses were removed from Iwilei to Kalihi, and Dr. Sloggett wanted a mosquito campaign started.

In 1904, care of the indigent sick as well as the dead became recognized as a public charge, and the first citizens' mosquito campaign was reported.

SECTION II.—POPULATION.

Population Table.

Year.	All Islands.	Honolulu.
1853	73,138	11,455
1860	69,800	14,370
1866	62,959	13,521
1872	56,897	14,852
1884	80,578	20,487
1890	89,990	22,907
1896	109,020	29,920
1900	154,001	39,306
1910	191,909	52,183

It is impossible from the census of 1910 to give the exact proportion of the various races composing the population of Honolulu as distinct from the whole Territory. The nearest estimate, which, of course, is not correct, is to assume that the people of Honolulu are divided as regards race in the same proportion as that of the Territory, which gives the following:

Hawaiians and Part-Hawaiians.....	10,482
Anglo-Saxon, Teutonic, etc.....	4,043
Latins, Portuguese, Spanish and Porto Ricans..	7,935
Oriental	28,790
Blacks and others	933
Total	52,183

SECTION III.—THINGS TO BE SEEN.

Honolulu first impresses the average traveler as beautiful, sometimes by comparison as clean, but his second impression, if he observes at all, must modify his first. If beauty is perfection made useful—Honolulu is far from beautiful.

Let the visitor move off the main streets into the alleys; let him climb through any block or square; he will come away with a composite picture of cheap, temporary structures, wooden sidewalks, piles of driftwood and brush for fuel located in corners and under houses, garbage and refuse everywhere, rickety lean-tos, dark and dirty kitchens smoky with grime and soot, damp and

rotten wooden paths or walks to enable one to keep out of the surface drainage during rain and out of the slime at other times. He will find places with most inviting entrances and fronts, where the conditions in the rear, usually unseen, are disgraceful if not dangerous; yards graded and filled but the space under the house left low to catch and hold water; leaking taps, broken plumbing and disgusting toilets, tottering outside staircases, broken verandas, defective gutters, rusted-out leaders, everywhere splendid protection for rats with ample food for them, and magnificent breeding places for mosquitoes. Let him lift any board that has been on the ground for some time and observe the cockroaches that are certain to be found.

Let him watch the people passing about bare-footed, notice the bits of food waste scattered about by children, cats, dogs and chickens, then left to decompose in courts or in areas where the surface is nothing but foul, damp earth.

Now, let the stranger move out of the crowded portions and observe the wet agriculture permitted close to the city's center. Taro, growing alongside of otherwise charming cottage residences, saturating the adjoining ground. One property owner indifferent, another careful and painstaking.

Let him note cottages with the space under them rarely left open, but boarded up, battened, or latticed, as if the owner intended to provide protection for the rat against his natural enemies, for into the lattice, between the battens, and under the boards neither cat nor dog can follow.

This will explain some of the difficulties encountered during the struggle for a clean, healthy city.

There are those who believe the past improvements in our sanitary condition have been adequate. There are others who think we have a healthful climate and that is quite enough, while another class are of the opinion that we are already far in advance of other communities similarly located and so should be contented and indifferent.

SECTION IV.—SANITARY SURVEY.

Honolulu is a city of magnificent distances, large impenetrable blocks and great contrasts. It lies along six miles of waterfront, scatters over flats and stretches up the slopes to the foothills into

five valleys, that cut the main ridge of mountains, and it spreads over into the ridges between them.

The District of Honolulu is some 44,000 acres, not more than one-tenth of which can be said to be inhabited. About one-third of the whole is swamps or under wet agriculture (36 per cent). There are 130 miles of streets, roads and lanes covering 855 acres.

We have marked on the maps 18,381 buildings, and omitted from lack of time Nuuanu Valley above Judd Street, and all of Kapalama beyond the Rice Mill Road, and above Liliha Street from School to Judd Street. In this Survey 12,800 acres were examined. We found more than 2,600 connections with sewers, 2,263 cesspools, 2,403 privy vaults and 37 dry closets..

In the disposal of refuse, yard and house, 38 householders claimed to bury it, 4,914 to burn it, and 1,713 patronized the garbage service. As to food waste, swill, 68 householders burned, 2,221 feed it on the place, and 4,060 reported that swill men took it away. We found 3,272 householders kept chickens and 197 of them kept them under their houses. Of all the buildings only 3,273 offered free access for the enemies of rats, while only 303 were of cement or bricked in, so that 15,410 remaining buildings offered ideal protection for rats.

We accounted for the sleeping accommodation of 49,145 people, including 15,375 children, located in 7,941 dwellings, 12 boarding houses, 34 hotels, 193 lodging houses, and 470 tenements; using 266 garages, 897 stables, and 1,374 stores.

Everywhere we found sidewalks just built as if to harbor rats. The boards are often a danger to pedestrians. Between the cracks lies evidence of one reason why they are maintained—the space below furnishes a place for hiding tin cans and waste of all kinds.

There is no more marked evidence of indifference to sanitary conditions than the wooden sidewalks which border our streets. They are relics of the past which appeal neither to the useful, the esthetic nor the artistic, nor can economy be claimed for them. At best they are temporary make-shifts and they must be banished.

The most crowded section under existing conditions is the 78½ acres that lies between Beretania, Fort, Vineyard and Liliha Streets. On this low lying land live 5,667 people, over one-tenth

of the city's population. This gives a density of 72 to the acre. Our survey shows tenement conditions existing in 124 of the 862 buildings, 124 owners or tenants keep chickens and 32 maintain them under their houses.

It is surprising to find in our balmy climate that so many people are afraid of fresh air. An inspection shows windows nailed up, covered with cloth or paper with the cracks stuffed up as if in arctic weather; people living in dark, close rooms, by preference, due, of course, to bad habit or custom.

The worst existing conditions are in Kakaako beyond Punchbowl and below Queen Street, where, with a density of only 54 people to the acre, we find the ratio square feet of openings per 1,000 cu. ft. of air space down to six, and this is the only portion of the city where it falls below eight—the standard.

A death rate of over 20 per 1,000 in a city like Honolulu indicates that it is far from being abreast of the times in sanitary conditions.

That our constant, even temperature and moisture is against us cannot be admitted as insurmountable, when we see that in the canal zone the engineers have reduced the death rate to under 10 (excluding new arrivals) and that there the heat and moisture are far greater than here in Honolulu.

SECTION V.—TENEMENTS.

As already shown, in 1880 an Act was passed by the Legislature providing for the sanitary control of dwelling houses. This was evidently in order to prevent the over-crowding in tenements. Among other regulations it provided that such buildings must have water-tight roofs. Previous to 1880 there had been some control over hotels and victualing houses, even as far back as 1846, when the Act to organize the executive departments was adopted. Prior to that on May 11, 1842, a license was required for public houses, but the control, in none of these years, was for sanitary purposes.

Not until 1890 was there any other attempt to legally control our tenements. The Legislature of that year established a license for lodging and tenement houses, hotels, boarding houses and restaurants, the fee for which was nominal, but no license could be

granted except on a certificate from the Board of Health to the effect that the sanitary condition of locations and buildings was satisfactory and suitable. Among the seven conditions of the license was one as follows: "Building and premises shall be kept in good sanitary condition in accordance with the law and orders of the agent of the Board of Health." Penalty was provided for those who failed to secure licenses, or who, holding one, violated the requirements and conditions.

In 1899 the conditions were amended by prohibiting any tenements or lodging houses to be established or maintained in any locality which the Executive Council thought unsuitable or objectionable—a wise provision which disappeared with the Executive Council.

In 1908, September 28, the County of Oahu ordained that no tenement could be built within 50 feet of any public school and provided a penalty of \$200 with new offense for every day of its continuance. This was re-adopted by the municipality on January 25, 1909.

In 1909 (Act No. 151, Page 208), the Legislature turned over all licenses of this nature to the municipality or counties.

We advisedly say the Board of Health's share for the difficulties with tenements is under so many sources of control that the divided responsibility causes little to be accomplished and accounts for the present intolerable conditions, not only because the environment of these poor people is unhealthy, but because the social and moral environment is seriously affecting public welfare.

The last Grand Jury severely commented upon our tenements as a source of crime, and recommended that the building regulations of tenements be so revised that the common decencies of life might be observed by the tenants.

Our survey of sanitary conditions shows 470 buildings in Honolulu in which tenement conditions exist, 124 in the area bounded by Fort, Vineyard, Liliha and Beretania Streets. This area contains approximately 51 acres with a density of population of 110 to the acre.

The responsibility for our tenement condition is so divided that it is lost.

Back stairs that are too rickety for fire escapes need to be prohibited in the building ordinances as much as anything that

is made unlawful in the fire laws. The results of defective plumbing are as much due to the sanitary inspectors as the plumbing inspector, and who is to blame?

Those who live in tenements are entitled to better protection. They are now under the sheriff, the fire marshal, the building inspector, the plumbing inspectors, and the Board of Health inspectors. Surely they do not need more protection.

Other cities suffering under the same divided responsibility have established Tenement House Boards or Commissions of a permanent nature and centered all authority in them; notably New York, where the commission can not only order any tenement vacated, but has the authority to order one removed so there will be no longer temptation for further use.

Our worst living conditions are not in the dwellings owned outright by the poor, but are found in buildings which are held as an investment or rented for revenue. The owner of no other class of property is allowed to offer it for use or sale when in such a dilapidated state that its condition makes it a menace to public health.

SECTION VI.—LARGE BLOCKS.

The most striking feature of our city is that of the large areas without proper openings or streets.

Turn to any map and observe the more than 20 acres bounded by Nuuanu, Kuakini, Liliha and School Streets, cut by a stream but by no open thoroughfares for access in case of fire, for water or for sewer service.

On this and the adjoining block towards the sea 1,920 people live. The large rectangle below Vineyard from Liliha over to Fort Street is the most densely populated area we have, there being 5,667 people living within four streets.

Examine any portion of the city, and you will find large areas inaccessible and around which transportation is forced. When these blocks have few people on them and are of little value there is no great need of thoroughfares, but there are so many blocks that should be cut up it is impossible to enumerate them all. Two years ago a plan for opening certain blocks was presented to the

Chamber of Commerce by Dr. J. S. B. Pratt. His map is still in existence and is excellent as far as it goes.

The unwieldy size of so many blocks is a serious defect in the growth of our city and the economy of life in it. This condition exists in almost every portion of our city. It is due to slow growth and habit. Through these causes, citizens become indifferent until the density of population or sanitary necessity forces action, and this, of course, is always a great expense to the public treasury.

One cause is the complicated legal machinery to be operated when attempting to open a new street, the long delays it provides and permits and the prominence it gives to damages while betterments are all but ignored, as well as the fact that proceedings may be stopped at any time at the discretion of an official.

Many of our people have come to think it right that the whole Territory should provide Honolulu with funds to pay all damages and one-half of the betterments on property to be taken for highways in the municipality.

Progressive citizens in active cities elsewhere recognize that betterments in time always more than offset damages, and the remnants often become of more value than surrounding property and set the standard for its value. They recognize that the city cannot grow and develop reasonable progress without assuming some limited risks.

SECTION VII.—NEW STREETS.

We believe that the people of the City and County of Honolulu should demand that the old-fashioned, antiquated customs be shed in order that the future of the city may not be hampered in its growth, and in order that the inhabitants may fully develop their opportunities.

It is time to give up the guardianship of the Territory, pay our own bills for the original capital outlay needed for new street improvements, to lay therein water and sewer mains, and to build thereon sidewalks, curbs, gutters, and to pave or macadamize the same. The need of this is great, and the situation must be faced. There is not revenue enough for such purposes and we have not the right to ask the whole Territory to pay for such improve-

ments, nor can we continually delay for the necessarily slow movements of territorial legislation.

We have abundant local capital, and, if the cost of needed improvements can be put in legal shape, it will supply a demand for an investment that will keep this capital at home where the interest payments will be disbursed as incentives of economy and thrift to many small investors.

The burden of our street improvements can be lightened by distributing it over a number of years, letting the unearned increment in a measure offset the cost. The gain in sanitary conditions will be more than sufficient to pay the interest, and there is a saving to be made in laying out and putting through needed streets before the increased population enhances the value of real estate.

If the right of eminent domain can be used by a majority of those owning the property through which a proposed street is desired, then the more intelligent property owners can secure immediate improvements and when they have demonstrated that their foresight has increased the value of the land others will follow, and Honolulu can then become through its own efforts a city worthy of her natural surroundings.

SECTION VIII.—MOUTH HYGIENE.

Among living conditions there is no topic more neglected in discussion or ignored in public activities than that of mouth hygiene. Our dentists are supersensitive and fear to be accused of crying their wares. We do nothing collectively to save the waste from neglected mouths and teeth.

The Chicago Board of Health feels justified in announcing from their research work that the seat of infection of pneumonia is in the media around the teeth and in their cavities, and that it passes in some way as yet unknown to others; but they feel certain that the care of the teeth will reduce, if not control, the mortality from pneumonia. Pneumonia in Honolulu is near the top of the death list.

Many cities now provide free clinics for schools, at which the child is examined, not alone for defective teeth, but for his throat, ears, eyes and nose. There are many among us who do not realize the importance of mouth hygiene. These very individuals

would refuse to sleep in a room or in a house permeated with the odor of decaying flesh, yet they remain indifferent to the condition of their mouths and become accustomed to their own offensive odor, and expect their system to absorb all the poison of their own decomposition.

Many carry the tell-tale scars, showing how unnecessarily they have suffered. The ignorant expect both children and adults to pass successfully through ordeals of such nature. They do not seek relief until after months of pain, then failing to get well, their vitality exhausted, possibly having contracted some other disease because of their condition, they conclude to pay for a doctor but rarely a dentist. Much of health depends on the teeth. Prevention costs so little. The loss of sick days is often far greater than the cost of care.

HEALTHGRAMS.

"Typhoid to prevent costs a few cents, to cure costs many dollars."

"All is not pure that sparkles. Sparkling water may be loaded with typhoid germs."

"Dope for cold is meat for doctors."

"Vaccinate and save your face.

Smallpox is a disgrace."

"Don't serve your friends food or drink, unless you know it is safe from flies and filth."

"The danger line from the water-closet to the china-closet should be restricted by washstand and towels for use."

"Make your neighbor's yard jealous of your back yard."

"Alcohol has hammered hob-nails into many a man's liver."

"In the consideration of health, an ounce of intelligence is worth a ton of ignorance."

"A diversified industry that is certain of profit—raising strong, healthy human beings and keeping them alive."

"Do unto others as you have others do unto you"; meaning "don't carry disease germs about and cause sickness, perhaps death, among your friends."

"As long as the thickly populated portions of the city are kept in good sanitary condition, and the water supply remains uncontaminated, the conditions of health will continue favorable."—David Dayton.

"Dust is dangerous."

"The greatest wealth is health."

"The sanitary condition of a community is a matter that each individual should take interest in."

"Build your reputation for civic pride in your back yard."

"Because your neighbor throws garbage into the street, or alley, is no reason why you should follow his example, but it is a reason why you should set him a good example."

"Colds are catching."

"Eat less that you may eat more tomorrow."

“Health is not put up in bottles, neither can it be bought at the corner drug store.”

“Fruit a la filth—the kind you buy from stands exposed to dust and flies.”

“Where the sun does not go, the doctor does.”—Italian Proverb.

“Keep your hands clean. Soap is a good friend, dirt an enemy.”

PART III.—RECOMMENDATIONS.

CHAPTER 13.—GENERAL BETTERMENTS.

SECTION I.—WET AGRICULTURE.

We recommend to the full consideration of the public the plan of control of wet agriculture within the city limits.

We urge that the interests of health and comfort require that every person who wishes to flood any land within the proper limits of the city for the purpose of raising a crop of any kind that must stand in water during a part of its growth, shall be required to pay a reasonable fee and to secure a license, the conditions of which shall be:

1. A description of the land, giving the area in square feet.
2. That the boundaries shall be at least 50 ft. from any building.
3. That during the term of the license no building shall exist on the property described.
4. That the land shall not be used for human habitation or any other purpose than wet agriculture without first securing a cancellation of the license, and without first abandoning the wet agriculture proposed.
5. Any violation shall, upon conviction, be heavily penalized.

This plan would at least clearly define the area of land used in wet agriculture and which is peculiarly subject to contamination and which offers especial opportunities for mosquito breeding, and therefore requiring careful watching and inspection in order to protect the public health.

SECTION II.—RECLAIMING SWAMPS.

It is obvious that all swamps and low lands which may become swamps should be filled or otherwise reclaimed, in order that their ever-present menace to health shall be entirely and finally removed.

A careful study of the question shows many difficulties, not the least of which is the great cost involved. It has been impracticable for this Commission to prepare detailed plans for this reclamation work. The survey made for this Commission shows the wet areas and contains much other information. We therefore recommend that the best method to pursue is, first to secure an expert engineer—one experienced in swamp reclamation—and secondly to provide sufficient funds to enable him to make a detailed survey of, and report concerning all the wet lands within the city limits.

This survey and report should cover the cause of the swamps; the various sources and volume of water in them; the various methods of obliterating them together with the cost and advantages of each and cost of material available for filling purposes.

After this data is obtained and reported, the engineer should then prepare complete and comprehensive plans for entire districts. These plans should include storm drains sufficient to provide for the great rainfall on all the tributary area. Preliminary drains can be cut to conform with the final location of the storm ditches. These would immediately lower the level of the standing water and reduce the swamp areas to a minimum, so that they can better be cared for until funds are available to obliterate them. Thus gradually and finally these sources of danger, which constantly menace our health and seriously affect our good name, will be destroyed.

We urge this course for the following reasons:

1. In order that each piece of work as undertaken may be final, complete and in conformity with all other parts or portions of the work, that must eventually be done in order to be rid of the swamps.
2. In order that, with complete information concerning all the swamp lands in the city, the immediate need may not unwittingly result in a sacrifice of one portion for another, by:

taking from it the material best located and most economical for its use.

3. In order that economy may be obtained in filling as large tracts as may be conveniently handled in one operation and in order to study carefully the best sources of material needed.
4. Because Congress is more likely to listen to an appeal for assistance, if we are thoroughly informed and there are definite grounds on which to ask aid, seaports being a source of national wealth and their health affecting the nation's commerce.

SECTION III.—OPENING STREETS.

We recommend legislation to provide means by which new highways may be opened more easily and freely than at present.

We urge the passage of a law under which the initiative shall come from a citizen who owns property, a portion of which is to be taken for the proposed highway, and a law in order to be effective requires the consent of the owners of more than half the area of the property to be affected.

This area should be determined by some official, to whom the application of the citizen with his rough description and map is to be referred, this official should then submit the same to the tax assessor, who should be required to furnish a more detailed and accurate map of the area to be affected, showing, as near as may be, each separate piece of property affected, with the name and address of the last known owner, the number of square feet in each, and the assessed value of each together with the value of the improvements stated separately.

This information, secured without cost, should in a given time be returned to the applicant in order that he may, if so advised, proceed to request the consent in writing of sufficient owners to satisfy the requirements of the law. Upon presentation of such consent, it should be the duty of a proper official to appoint appraisers to determine the value per square foot of each piece of property, and the value separately of the improvements.

Immediately after the appraisal, by exercise of the right of eminent domain, the property necessary for the project should be

condemned. In this process the betterments should first be determined, and thereafter damages, if any, fixed.

The responsibility for each step in the process should be clearly defined and a reasonable time allowed for the execution of each step, together with a penalty for failures.

It should become the duty of the proper person to certify to the official in charge of finance the amount of money needed to pay for all the property condemned, the cost of condemnation and the cost of appraisal.

It should be made the duty of the official in charge of road construction to have prepared and furnished in a stated time to the financial official estimates of the time required and the cost of construction of the improvements asked for in the application, and these improvements obviously should include all original capital outlay needed for the completion of the highway in a manner suitable to the nature of the surroundings, either by paving, macadamizing, or surfacing with coral or dirt, with water and sewer mains, sidewalks, curbs, culverts, storm drains, and all similar improvements requested in the application included.

To the cost thus stated should be added the interest to be paid out during a period of ten years, together with the cost of providing for and securing all the funds necessary for the project—such as printing, advertising and whatever else may be reasonable to aid the sale of bonds or other securities of like nature, issued by the city and backed by a lien on the property benefited by the improvement.

After the sale of these securities, the funds should be divided and placed in separate accounts, one, a special fund to meet the interest, and another for the "project." From the latter by proper means the payments should be made, first for the property condemned, with provision for a deposit in the Circuit Court or elsewhere in case of a delay in any settlement beyond a specified time; secondly for the construction of the improvements as needed.

The law should require the Territory or municipality to complete the project within the time and at a cost not exceeding that specified in the estimate by its official.

The securities or evidences of debt, whether local improvement bonds, script, or whatever form that may be thought best, should

be issued in denominations discretionary with the financial official, one-tenth part of the whole redeemable each year, guaranteed by the municipality and secured by a prior lien on each piece of property in the area affected after deducting that needed for the highway. Each lien should be for an amount which bears to the whole sum of the securities sold the same ratio that the appraised value of each piece of property bears to the sum of the appraised value of the property in the area affected; so that, if any owner places a high valuation upon his property as compared with those around him, then he will be subjected to a proportionally larger lien.

The law should make these bonds or securities payable one-tenth each year, and enforceable precisely as are taxes, subject to the same penalties and provisions in order to secure their collection.

Such a law should provide machinery, that, once started, could not be stopped at the whim of an official. It should permit those who desire improvements and are willing to pay the cost to obtain them, thus preventing the blocking or delaying of progress, and should, of course, reasonably safeguard the rights of all.

SECTION IV.—WATER CONTROL.

To reduce the expense of supplying good water and to check the present extravagant waste, we recommend that all connections—other than for purely domestic purposes—be metered. That is, we believe the water used for all irrigation, for lawns, yards, gardens and vegetables, or any other mode of irrigation, for developing power, or for any manufacturing purpose, should be charged for in proportion to the quantity of water delivered.

At the same time all should be given a generous supply of water for personal needs, for bathing, washing, laundries, cleaning verandas, lanais, stables, poi shops, alleys, areas, courts, etc.

If a person is affluent enough to own his own garden or a swimming tank, or wants to run water into his rice or taro patch, he should pay for whatever amount he uses on a low and liberal basis.

This would reduce the cost of our water supply by preventing

waste, and reduce the expense of our sewer system, now over-taxed, resulting in a double economy.

SECTION V.—MILK CONTROL.

We recommend:

First—That the use of other than city water be prohibited in or about places which are the source of milk supply, except upon special permit of the Board of Health issued after satisfactory proof is submitted of the purity and good environment of any other proposed supply, a reasonable penalty for violation being provided by law.

Second—That all those in charge of dairies—the source of milk supply—as well as the owners of any cows whose milk is being consumed, and the owners of any land where cows are kept, be required to immediately report to the Board of Health any sickness among those who are likely to come in contact with the milk or its containers, and that any failure so to do be heavily penalized.

Third—That a heavy fine be imposed upon any person convicted of selling milk from cows infected with tuberculosis.

Finally, especial attention is called to the recommendations of the Milk Commission of 1910—that the control of milk be taken from the municipality and given to the Territorial Board of Agriculture in order to secure protection for the whole Territory, to remove the possibility of political favor and to insure an effective enforcement of regulations governing milk and its source of supply.

SECTION VI.—REFUSE DISPOSAL.

We recommend a free service for the collection and disposal of all waste and refuse within limits to be established by the municipality, covering the area where the congestion is greatest. Beyond those limits the municipality might remove all waste for pay.

No “pay system” over the whole city will be effective without power to penalize those who fail to provide for the disposal of their waste.

We endorse so much of Dr. Blue’s statement and recommend:

1. That there be “officially stamped containers” used for food waste (swill) which must be water, rat and fly proof.

2. That to keep or discharge food waste (within the limits of the garbage and excavator service) in other than official containers be made a misdemeanor and punishable by fine.

We believe that the man who deposits and leaves waste to decay should be taught that the responsibility rests on him. It is a matter of indifference whether the act be committed by the four-year-old son of an Oriental swill collector who keeps pigs, or the American foreman of a pineapple factory whose owner rides in a motor car.

SECTION VII.—TENEMENT HOUSE COMMISSION.

We recommend the creation of a special Tenement House Commission to study and report on tenement conditions.

For the purpose of this Commission the term "Tenement House" should be defined as meaning a multiple dwelling arranged for occupation by more than two families, each of which can live independently and do its cooking separately.

The subjects for study and report should be:

1. Protection against fire, and means of escape in case of fire.
2. Construction, material to be used, light and ventilation.
3. Sanitary protection, including:
 - a. Water supply.
 - b. Water-closet accommodation.
 - c. Laundry, bathing and kitchen accommodations.
 - d. Surface drainage under and above the premises, on or in adjoining alleys, courts or areas.
 - e. Garbage disposal.
 - f. Rat-harbors.
 - g. Mosquito breeding places.
 - h. Over-crowding.
 - i. Sewage disposal.
4. Method of enforcing health regulations.
5. Extent of power to be granted in the control of tenements.

SECTION VIII.—PUBLICITY.

We recommend that the Board of Health be authorized and required to publish a monthly bulletin for free distribution among the medical practitioners and school teachers throughout the Ter-

ritory, as well as among such officials of the Territory or Counties as may annually file requests for copies, and among such others as the Board may deem best.

For this purpose the Legislature should provide a specific appropriation to include the salary of a person to be placed in charge of such publicity work, say 5 per cent of the amount usually appropriated for health purposes.

HEALTHGRAMS.

"A common poison—a baby's bottle with a long rubber tube."

"Dirty milk kills babies—look for the dirt in the bottom of the bottle."

"No spit, no consumption."

"Kill the flies or they will kill you."

"It is not a waste of time to contend with self-satisfied ignorance, or short-sighted selfishness which opposes every effort for prevention and restriction of disease."—W. M. Gibson.

"Educate the mother and save the child."

"Much the hardest, most discouraging, and oftentimes the best work on the part of the employees of the Board of Health not only fails to reflect credit and appreciation where it is due; but on the other hand tends to great misunderstanding and harsh criticism on the part of the general public. I have never been associated with a more painstaking, hard-working, conscientious organization than the Board of Health of Hawaii."—L. E. Cofer.

"The five 'Fs'—filth, fingers, flies, food, fever."

"Closed windows are open friends to consumption."

"Let the first lesson be how to keep well."

"The fact is that all natives of this group are ignorant of the laws of health and hygiene."—Dr. George L. Fitch, 1882, Page 54.

"In saving the child you save the state."

"If you allow flies to flock into your place, your trade will fly from you. (A hint to restaurant-keepers, grocers and market men.)

"Chew your food—your stomach has no teeth."

"It is a careless community that neglects the health problems of its educational system."

"Not every fly carries disease germs, but you can't tell which does, so take no chances."

"Cleanliness is next to godliness," but it takes many godly people a long time to 'get next.' "

"Swat the fly."

"If there is a contagious disease at home, don't visit other homes."

"Encourage homesteaders by enforcing clean, healthy dwellings."

"Sometimes what you keep from the doctor you will give to the undertaker."

"Build out the rat—it is the simplest way to get rid of him."—Dr. Rupert Blue.

"Health is the supreme law."—Roman Adage.

PART IV.—RESULTS.

CHAPTER 14.—SAVING IN WASTE.

SECTION I.—LIFE AND ITS VALUE.

It has been shown that a large part of deaths are preventable, and that there has been in Honolulu alone during the year ending June 30, 1911, 1,251 deaths. If the knowledge now possessed can be spread among all of the 52,183 people living in Honolulu, a saving of a large number of deaths can be effected in a single year.

The necessities of agricultural industries and the desire for a greater population prompts, at large expense to the taxpayer, the importation of immigrants and has secured legislation which permits of a large sacrifice in the real value of our Government lands when placed in the hands of homesteaders.

If better sanitation was taught to everyone, and 500 lives were saved each year, the expense of immigration could be reduced and the annual increase of population would supply the real homesteaders—a natural demand for land not now cultivated. This should appeal to the reasonable man and secure a grant of more power to the Board of Health, if conditions are to be what they should be, and if intelligent advantage is to be taken of existing opportunities.

The value of life varies with age. It has been repeatedly estimated in capitalizing labor. In England carefully made figures have shown that human labor capitalized was worth five times all other forms of capital. Professor Fisher assumes for the United States \$700 as the average earning capacity of workers with 25 per cent idle, so that \$525 is the average earnings for all.

With this basis and the census as to age, he finds the average value of life to be \$2,900. The same theory applied at death gives the average value of each life at death to be \$1,700.

For Hawaii we believe the average earning cannot be much lower, and on the other hand we have not so many idle; but to be safe we will assume a difference of 20 per cent less; then our vital assets—the capitalized value of the lives of 52,183 people in

Honolulu—are \$131,064,560. Therefore, when providing for the sanitation of Honolulu alone, we are considering the protection of that which is almost as valuable as the taxable wealth in the whole Territory.

SECTION II.—VALUE OF PREVENTABLE LOSS.

The cost of unnecessary death and sickness offers the most tangible measure of the worth of sanitation and hygiene. Experts show that it is conservative to assume that life can be prolonged 15 years, that mortality can be reduced 40 per cent and morbidity reduced 30 per cent, therefore let us apply these results of careful study to our local conditions. Such reasoning may not be above criticism, but it will at least draw attention to our subject and enable the mind to better grasp or measure its importance.

Last year there were 1,251 deaths in Honolulu; of these say 25 per cent were not workers; this leaves 878 deaths of workers. In the United States the average annual earnings for all workers, from the highly-paid managers of corporations and the big professional men down to the workmen in the sweat shops, is said to be about \$700 per individual. Let us, to be safely conservative, assume for Hawaii one-half of that amount, or \$350, then those who died last year could have earned \$307,300. Now, by effort prevent 40 per cent of our deaths and the annual saving, based upon last year's record, is \$122,920.

If for every death there were two people *seriously ill all the time* and the average earning capacity is but \$350 per annum, then we suffer a loss from this cause each year of \$875,700. But all do not work, therefore deducting 25 per cent for the idle there is left a loss of \$656,775. Now, prevent only 30 per cent of serious illness, and there is an annual possible saving of \$187,032.50.

If every person loses three days each year from *minor ailments* and 25 per cent are idle, then there is a loss of 117,414 working days, which at \$1 per day gives us an annual loss of \$117,414. By preventing 30 per cent of this loss there is an annual possible saving of \$35,224.20.

Result.

Saving from preventable deaths.....	\$122,920.00
.. Saving from serious illness.....	187,032.50
Saving from preventable minor ailments...	35,224.20
<hr/>	
Total annual saving.....	\$345,176.70

This would pay 5 per cent interest on an investment of \$6,903,-534 expended in sanitary improvements.

These estimates do not take into account the time that life may be prolonged, which means that the average age at death can be postponed and the average length of life increased with its increased earning power. Nor do they take into consideration the possibilities of future medical discoveries, which are certain to increase the ratio of preventability; nor the saving in cost of medical attendance, medicines and nursing, or the saving in fatigue, or the accumulated effect of resisting power due to better health.

England reckons that the *lives* saved through the lowered death rate from what it was between 1866 and 1875 to what it became in the period from 1880 to 1889 amounted to 858,804 lives.

These lives represent, on the English basis of the per capita valuation of life, a social capital saved of \$650,000,000, and that without taking any notice of the saving due to sickness.

In ten years England has more than regained the sum spent in fifteen years for sanitary improvements, although the average annual expenditure was \$40,000,000.

CHAPTER 15.—POSSIBILITIES.

SECTION I.—ECONOMIC VALUE.

Of what value is it to make laws; to have courts, and to provide police and fire protection; to have schools; to build roads and bridges and wharves; to make other public improvements; to conserve our soil and water, to protect the forests, fish and birds, if we are without health to enjoy this wonderful inheritance; or, if those who live after us are to be without health to enjoy the bless-

ings that are passed on to them? If we are to be weak and sick, suffering from many diseases, and die in proportionately large numbers, all of these things will count for little.

Health, by which is meant the possession of a strong, well body, free from pain, should bring with it great power to work, to think, and to benefit the world. It should also bring great happiness and enjoyment to those who possess it.

The person who can get up in the morning and look forward to a day's work or a day's enjoyment, is the one on whom the world's real work depends. We seldom find a strong, vigorous mind in a weak body. The invalid is usually the idle member of the family or community. He can, as a rule, do nothing to help others, and thus there is a community loss in the labor of the sick and of those who care for him.

It is, therefore, not surprising that the world is awakening to the fact that there is a great waste of time, money, work and happiness, and the fact that if this waste can be stopped or checked, it is well worth all the time, study and the cost required to bring it about.

Physicians are now aiming not only to cure but to prevent disease, and they are discarding drugs in as many cases as possible.

Health means more ability to work, the accomplishment of greater things, more capacity to learn, more pleasure in everyday life, and so it is as important to preserve health as it is to prevent death.

SECTION II.—SELFISH GAINS.

It has been shown that environment may be controlled and thereby death postponed, disease prevented, more pleasure and enjoyment of life gained, work rendered a delight instead of a burden, and ability and capacity increased.

These are the direct and selfish results of enlightened sanitation and hygiene.

The isolation of Honolulu makes the task here easier and this should be an encouragement. The health of Honolulu can be bettered with greater ease than that of many cities. A death rate of 10 in every 1,000 is admitted to be well within the range of possibilities—this is less than one-half the present rate. The

climate is ideal, in it youth blossoms and old age remains full of vigor. The task should be taken up in earnest and every energy devoted to these ends.

SECTION III.—INFLUENCE.

We can by the application of the knowledge we now possess favorably influence by example the whole region of the basin of the Pacific.

Our surroundings can be so improved by intelligent effort for better sanitary conditions that we can attract, long before we reach ideal conditions, many who will see that we are determined to build here a city of wonderful health as well as beauty, and seeing this they will be more likely to decide that it is among just such people and in just such a city that they wish to live.

Thus others will join those who are struggling with tireless energy to overcome the habits, customs, and ignorance that binds us to an environment, which impairs our health and limits our energy, mars our happiness and causes unnecessary loss and waste.

Gradually, perhaps, almost imperceptibly, we will surely cause these detrimental conditions to disappear, until for health, comfort, and the joy of living, Honolulu will be the Mecca of a large part of the world.

HEALTHGRAMS.

“The first aid to the dyspeptic—a good laugh.”

“The more you expand your chest the less you will contract colds.”

“An anemic child is the ghost of civilization.”

“Hygiene aims to make growth more perfect, life more vigorous, decay less rapid, death more remote.”

“High living develops low vitality.”

“It costs no more to *raise* a man capable of living 80 years than it does to *grow* one who has not the capacity of living to be 40 years old.”

“In view of the results, it cannot be deemed too great a sacrifice to invest nearly one-tenth of the revenue of the kingdom for the promotion of health.—W. M. Gibson.

ACT 28.

AN ACT

To Authorize the Appointment of the Sanitary Commission of Honolulu and to Appropriate Money for the Expenses of Such Commission.

WHEREAS, owing to local conditions and its commercially central position in the Pacific, the City of Honolulu and through it the Territory of Hawaii are in grave and increasing danger of the introduction and spread of contagious and infectious diseases from the Orient and Mexico and Central American ports; and,

WHEREAS, owing to the large military and naval plans of the United States for said city and its surroundings and the position of Hawaii as a health outpost as well as a military and naval outpost for the protection of the mainland of the United States, it is of the greatest importance to the people of the Pacific Coast and the entire nation, as well as to the people of Hawaii, that timely and suitable action be taken to render said City proof against such diseases; and,

WHEREAS, owing to the possible extent and character of the work required for this purpose, plans based on a thorough investigation on the ground should first be formulated by experts; therefore,

Be it Enacted by the Legislature of the Territory of Hawaii:

SECTION I. That a Commission of five persons to be designated as the Sanitary Commission of Honolulu be and is hereby constituted to investigate the sanitary conditions of Honolulu with reference to present and future dangers and requirements and to report the result of such investigation with its recommendations of what work should be done and the necessary plans and specifications for doing it.

SECTION II. One member of the Commission shall be a civil engineer, one a physician and one an attorney-at-law. The members shall be appointed and commissioned by the Governor by and with the advice and consent of the Senate. The report of the

Commission shall be made to the Governor on or before December 31, 1911.

SECTION III. The sum of Five Hundred Dollars (\$500) or as much thereof as shall be necessary, is hereby appropriated from the Treasury of the Territory for the expense of the Commission, for transportation, clerical assistance, printing and such other expenses as the members thereof shall determine to be necessary. The members of the Commission shall serve without pay.

SECTION IV. This Act shall take effect from and after the date of its approval.

Approved this 20th day of March, A. D., 1911.

WALTER F. FREAR,
Governor of the Territory of Hawaii.

LIST OF DAIRIES IN HONOLULU OCTOBER, 1911.

Names.	Location.	No. Cows.	Qts. Milk.
P. M. Pond.....	Waikiki	70	500
C. J. Day.....	Kalihi Road.....	4	20
J. Nagaki.....	Manoa Valley.....	8	40
Mrs. Riedell.....	Gulick Avenue.....	5	29
F. H. Kilbey.....	Waiialae Road.....	8	55
J. P. Mendonca.....	Markham Lane.....	4	20
A. Tavares.....	Kunawai Lane.....	3	15
De Telles.....	Nuuanu Valley	4	15
V. Souza.....	Kalihi	14	60
J. Reicento.....	Kalihi-Kai	3	12
G. H. Wond.....	Fort Street	8	50
P. Isenberg.....	Waiialae	150	1050
S. Damon.....	Moanalua	106	565
Fr. Andrade.....	Manoa Valley	89	500
Chas. Bellina.....	Nuuanu Valley	72	510
G. Holt.....	Puhale	40	150
Fr. Correa.....	Kalihi-Uka	5	30
Miss Davison.....	Manoa Valley	9	36
Th. Gouveia.....	Kapahulu Road	16	104
A. Pires.....	Kalihi Road	7	45
H. E. Cooper.....	Manoa Valley	12	60
Kam School.....	Kalihi	18	110
S. Nobriga.....	Nuuanu Valley	7	30
S. Tumoto.....	Pauoa Valley	5	30
Omai.....	Sea View.....	8	45
T. F. Farm.....	" "	26	200
Moyekawa.....	" "	6	40
F. Medeiros.....	" "	3	15
Robinson.....	Nuuanu Valley	3	10
M. Kawamura.....	School Street	4	30
Fernandes.....	Middle Street	4	6
J. H. Cummins.....	College Street	4	30
J. M. Whitney.....	Punahou Street	5	20
Alex. Young.....	Kalihi-Kai	24	180
Mrs. C. M. White.....	Makiki Street	8	62
Kapena Richard.....	Puunui	2	8
K. Inoye.....	Sea View.....	8	45
S. Hirota.....	Makai Baseball Gr....	6	40
J. Takamura.....	" "	4	28
W. E. Miles.....	Kalihi Road	13	36
Mrs. W. E. Wall.....	Keaumoku Street.....	5	18
C. Allencastre.....	Beretania Street.....	3	10
R. Compos.....	Waikiki	6	30
H. B. Brown.....	Kaimuki	6	34
Kapahulu Dairy.....	Kapahulu Road	22	100
Gomes.....	Leahi Street	30	175
College of Hawaii.....	Manoa Valley	9	100
Yamashita.....	Ka-Moiliili	6	46
Frank Walpo.....	Laimi, Nuuanu Valley.	4	16
Mrs. Grace.....	Kaimuki	4	16
		890	5376
Private families about.....		25	100
Total.....		915	Total... 5476

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